THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVI. No. 1960.] LONDON, DECEMBER 4, 1900. [52ND YEAR. PRICE 6d.

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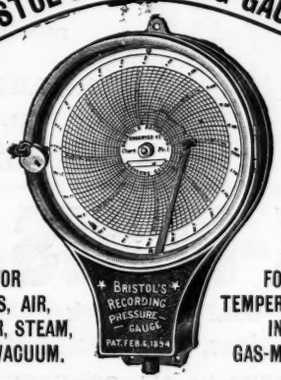

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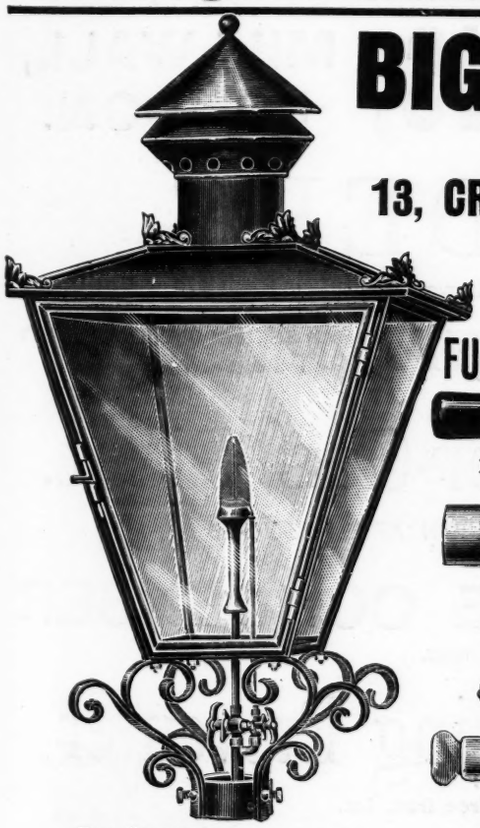

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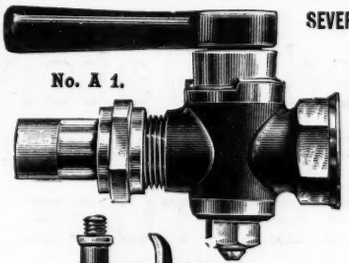
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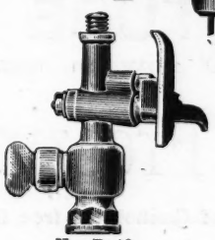
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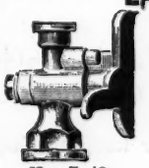
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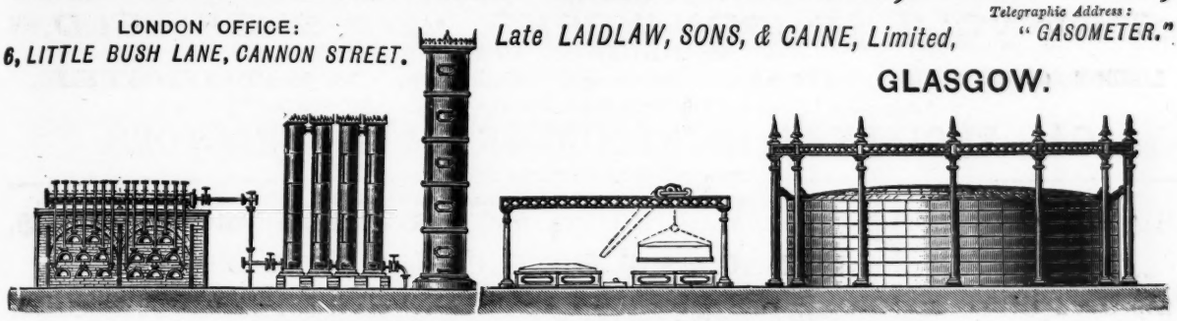

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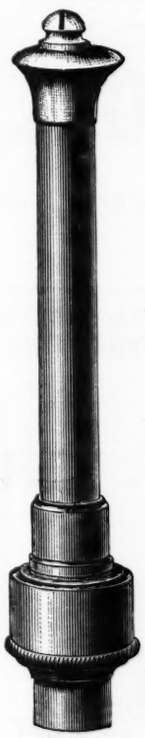

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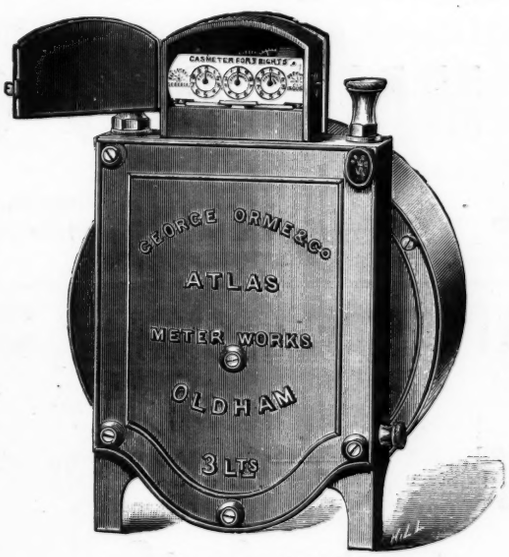

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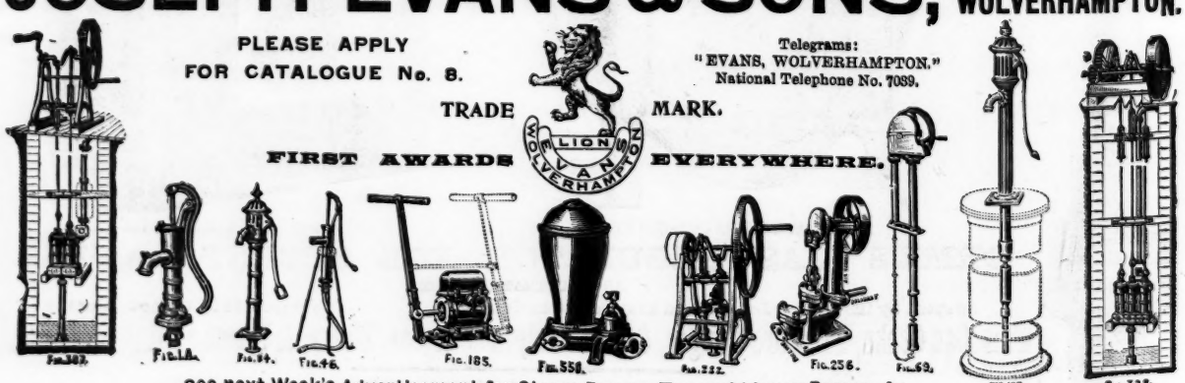

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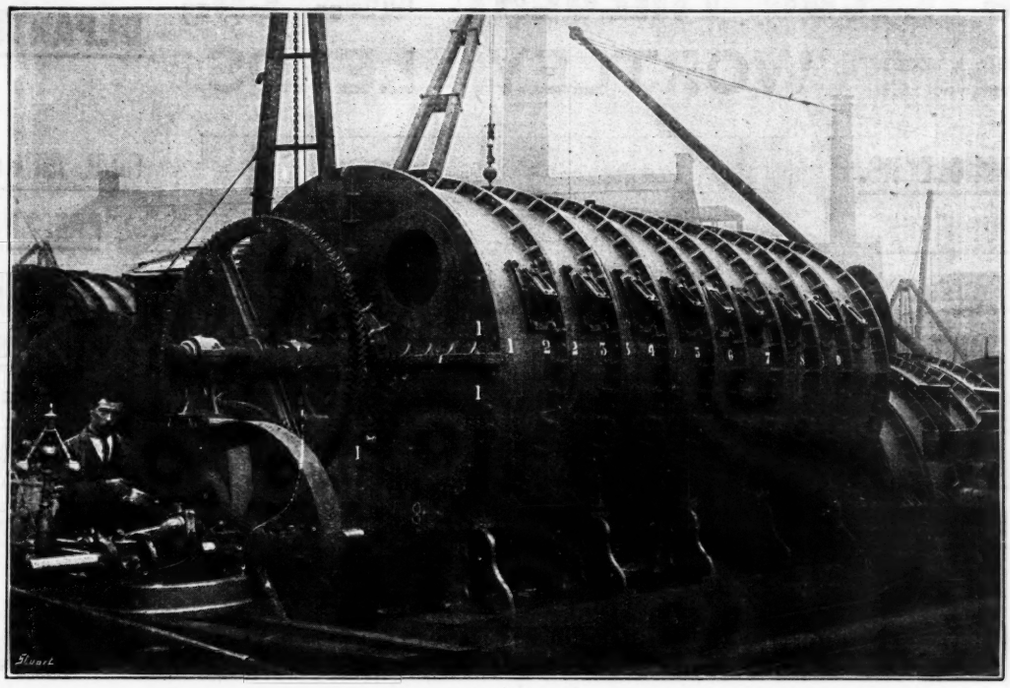

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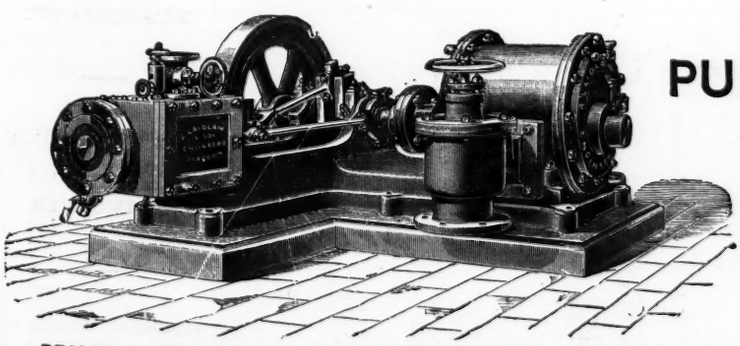

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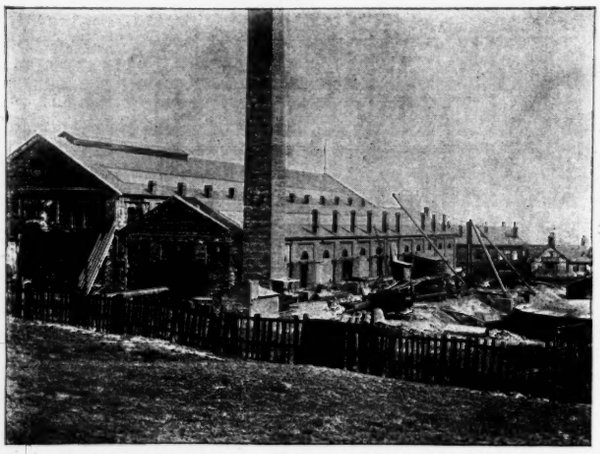

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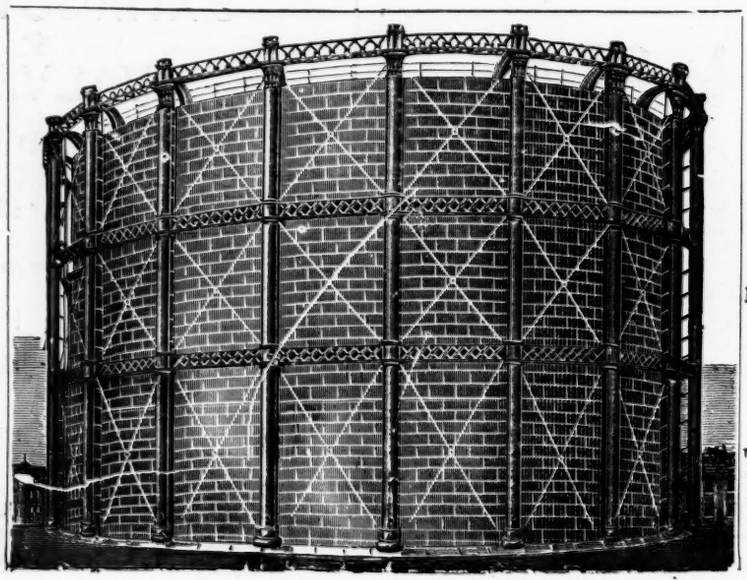

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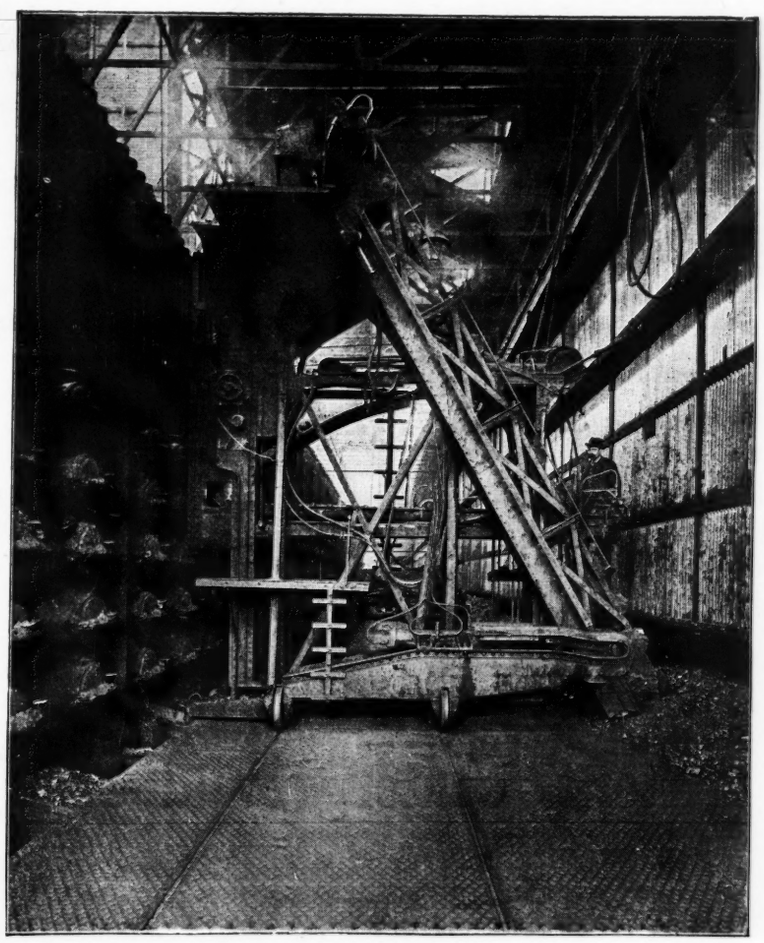

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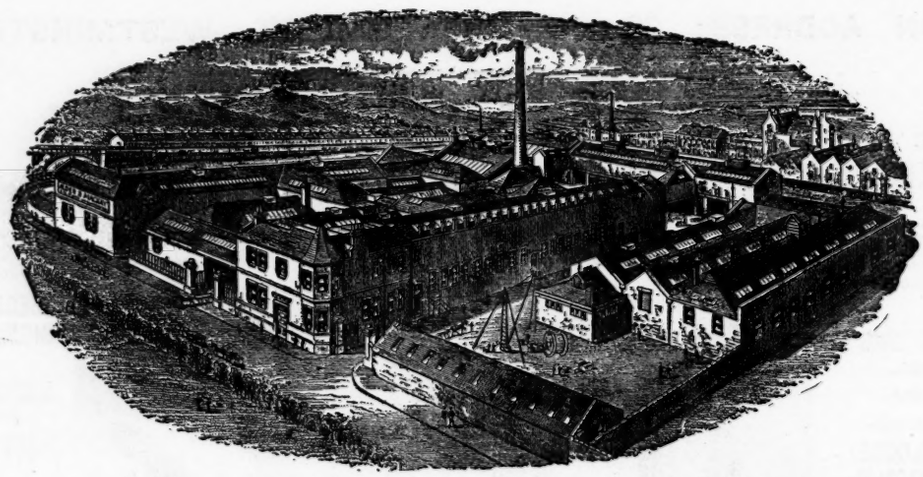

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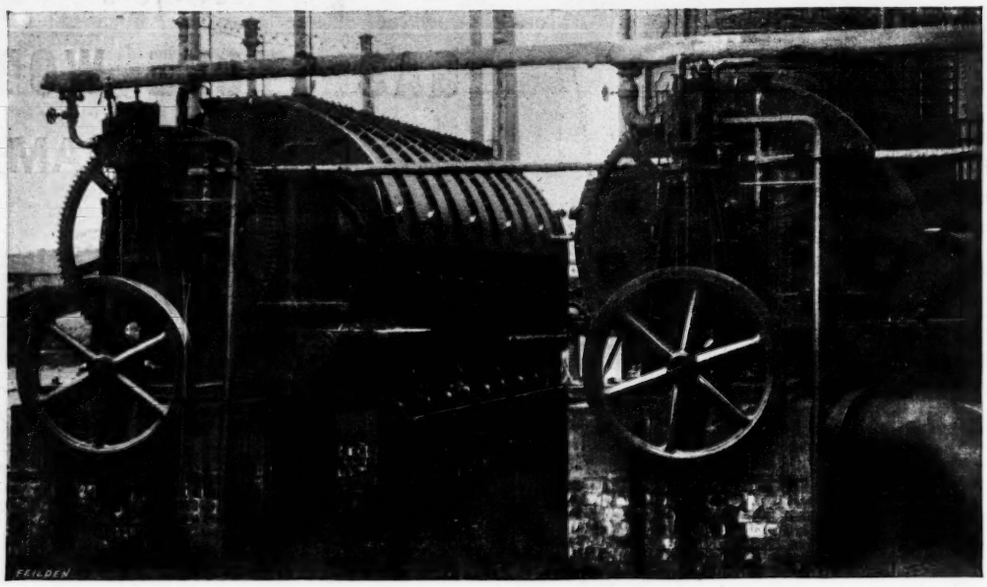

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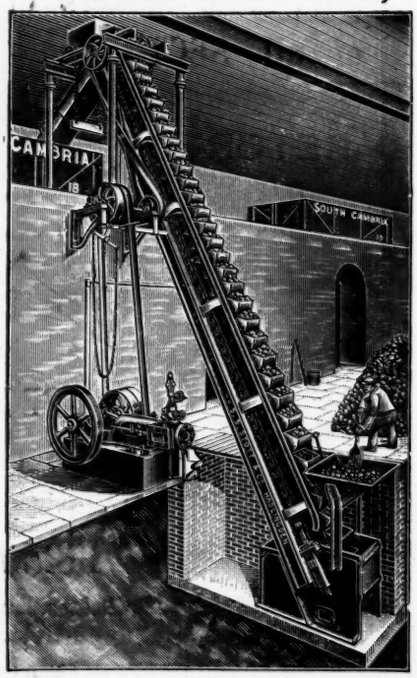

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Brussels-Ville (2nd)	750,000	Stockport	600,000	Dorking	150,000
Liverpool	3,500,000	Norwich	1,000,000	McKeesport, Pa.	500,000
Liverpool (2nd)	4,500,000	Holyoke, Mass.	600,000	G.L.&C.Co., Bromley	3,750,000
Tottenham	750,000	St. Joseph, Mo.	750,000	G.L.&C.Co., Nine Elms.	2,750,000
Tottenham (2nd)	750,000	Lea Bridge	350,000	Durham	200,000
Santiago de Cuba	400,000	Lea Bridge (2nd)	350,000	New York	4,000,000
Swansea	750,000	Stockton-on-Tees	500,000	Scarborough	800,000
Manchester	3,500,000	Edinburgh	2,000,000	Perth, W.A.	125,000
Brighton	1,750,000	Guildford	350,000	Bremen	550,000
Preston	1,400,000	Brentford	1,200,000	Maidenhead	225,000
New York	1,200,000	Syracuse, N.Y.	850,000	Epsom	225,000
Southport	750,000	Bridlington	150,000	North Middlesex.	150,000
Bath	1,000,000	Middlesbrough	1,250,000	Wandsworth.	1,800,000
Newburg, N.Y.	350,000	Croydon	1,250,000	Aarhus	800,000
Newburg (2nd)	250,000	L. & N.W. Ry., Crewe	700,000	Falmouth	150,000
Hoylake	125,000	Taunton.	225,000	Southampton	800,000

SINCE JANUARY 1ST, 1899.

Hartlepool	750,000	Stockport (2nd)	600,000	Faversham	200,000
Utrecht	1,000,000	Croydon (2nd)	625,000	Birmingham (Swan V'ge)	1,500,000
Deventer	150,000	Maidenhead (2nd)	225,000	St. Gallen (Switz.)	225,000
Portsmouth	1,000,000	G.L.&C.Co., Beckton	2,250,000	Colney Hatch	400,000
Bournemouth	1,000,000	G.L.&C.Co., Fulham	1,750,000	Southampton (2nd)	500,000
Aylesbury	150,000	Tottenham (3rd)	350,000	Tunbridge Wells	1,000,000
Hamburg	1,750,000	Sydney (Harbour)	500,000	Hebden Bridge	200,000
Redhill	275,000	Sydney (Mortlake)	500,000	Chorley	300,000
Dublin	2,000,000	Manchester (2nd)	3,500,000	Liège	1,000,000
Posen	450,000	Hull	1,500,000	Stafford	500,000
Dunedin (N.Z.)	150,000	Longton.	600,000	Bridlington (2nd)	200,000
Lincoln	500,000	Staines	600,000	Gosport	200,000
Antwerp	1,500,000	Commercial (4th)	2,000,000	G.L.&C.C., Beckton (2nd)	10,750,000
Brussels-Forêt	1,000,000	Dublin (2nd)	2,000,000	Tottenham (4th).	1,000,000
Brighton (2nd)	1,850,000			Brussels-Ville (3rd)	1,500,000

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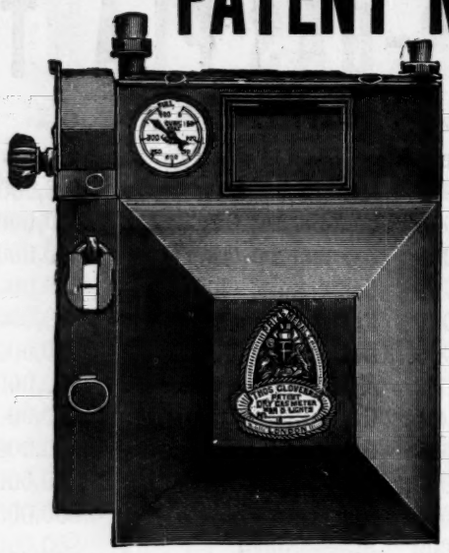

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EDITORIAL NOTES.

Brightening of the Coal Outlook.

EVIDENCE reaches us daily, from both public and private sources, in proof of the steady, though not as yet rapid, downward movement of coal prices, and of the striking difference between the position of the gas industry in regard to coal supplies at the end of 1900 from what it was at the commencement and throughout the first four months of the year. It is now literally true that gas coal is going begging. There were recently, we are informed, barges in the Thames containing some 600 or more tons of gas coal for which no buyer could be found within the space of three weeks. Last December, they would not have wanted a customer for three minutes. But then, last December the London Gas Companies were beginning to be seriously alarmed at the rapid depletion of their coal-stores, and the lagging of contract deliveries; whereas now they hold stocks fully the double of those that were ebbing away this time last year, and supplies are pouring in freely from every contractor. We should say that there are not less than 350,000 tons of coal in the stores of the London Gas Companies to-day more than there were twelve months ago; and, as the perversity of fate, or of the oil merchants, will have it, the supply of oil is just now so abundant that the available tank storage is inadequate to contain the quantities the contractors are desirous of delivering. It is not, therefore, surprising that the faces of all gas managers who have not committed themselves far ahead in their coal purchases are somewhat of a contrast to the weather in regard to cheerfulness.

Among the public indications of the "creep" in coal prices may be mentioned the reduction of 2s. in their house-coal rates by the Forest of Dean collieries as from the 1st inst., and of a simultaneous reduction of 1s. in the list price of Scotch splint coal. The 1st of December is indeed a most unusual date on which to witness a marking-down of house coal; but the state of the trade leaves the owners no option if they wish to see the coal removed from the pit-head. And, unless there soon comes a spell of very severe weather, the owners in the other districts, and the merchants everywhere, will shortly have to follow suit. The railway sidings are choked with coal-laden waggons; and the consignees are thus between the "devil" of demurrage charges and the "deep sea" of lowered prices. As many of the merchants to whom the coal has been forwarded are under contracts with the collieries or factors at "boom" prices, this is a more serious matter for them than may at first sight appear. The smaller fry among the merchants are not men of unlimited capital, nor all of them of very far-seeing policy; and it is more than doubtful whether the unusual profits that some have made during the past year are still available to enable them to stand the racket of a drooping market. If, further, they have bought coke for future delivery at top prices—as, in fact, many of them have—there will be not a few collapses and unfulfilled contracts before many months go by. Gas managers will in some cases find it no less difficult than did Shylock deem it to obtain the pound of flesh that is in the bond without bleeding the contractor to death. They will be ill-advised to wreak upon the coal merchants vengeance for the extortionate policy pursued this year past by certain of the coal-owners.

To revert to the existing situation in the coal market. The railway companies are reported to have taken recently a sounding, but to have found the water to be still too deep. The owners, it is said, offered a reduction of 1s. a ton on present contract prices—which, be it remembered, are more than 5s. above the normal. We are glad, though not by any means surprised, to learn that the railway companies did not think it quite good enough. Indeed, to use a school-boy's phrase, we can only say of the coalowners that it was "like their cheek" to make such a proposal. They will have to climb down considerably lower than that to find buyers, who, fortunately, appear to be fighting shy of contracts for next year with practical unanimity. Hand-to-mouth buying is, in fact, the order of the day, not only as far as home consumers are concerned, but also as regards most foreign purchasers, and with the output expanding, demand falling, and stocks heavy, coal buyers will very soon be able to name their own terms, instead of having to accept those inflicted upon them by the collieries.

We have spoken of an expanding output. The writer of a decidedly able article on the "Decline in Coal" in the

"Economist" of the 24th ult., expresses the opinion that "this year there will be no increase, and it is even doubt-"ful if the output of 1899 will be equalled." This must, of course, only be a matter of conjecture, as, unfortunately, no statistics of output are published except the annual. But we do not for a moment think the opinion quoted will be substantiated by the event. The writer, in his calculations, assumes a decreased home consumption of 4½ million tons, to set against the increased export of 2 millions. We fail to see any ground for the assumption. He estimates a reduction of 630,000 tons in the railway companies' requirements. Do the traffic returns support this view? We think not; for trade, until quite recently, was fully as active as in the corresponding period of last year. And what of the increased stocks held by everyone at the end as compared with the beginning of the year? So far as the gas industry alone is concerned, this must represent an increased output of well over half-a-million tons in all. Moreover, householders' cellars are well supplied; merchants have big stocks; and everywhere coal stores are better filled than a year ago. We shall, therefore, be much surprised if the output for the twelve months now drawing to a close does not prove to have been considerably in excess of that for 1899.

Fresh sources of supply are, moreover, now being freely tapped; and the influx of the output from these additional seams and pits will tend to counteract any attempted restriction of tonnage by the miners. With the number of men seeking employment—among whom the Penrhyn quarrymen will be prominent—increasing steadily as trade slackens down, there will be no lack of miners in the immediate future. The situation during the first year of the New Century is, then, most likely to be one of glut in the coal market. We are afraid there are some quarters of the gas world in which the event will prove a source of a certain amount of mortification, by reason of not having been earlier foreseen.

The Mond Fuel-Gas Scheme.

Notice has been given of an intended application to Parliament, by a Company to be incorporated, for power to manufacture and distribute "gas, and particularly the pro-"duct commonly known as 'Mond Gas,' for motive or other "power, heating, or for any other purpose to which such gas "can be applied, except illumination." The works are apparently to be situated at Tipton, Bilston, Darlaston, Kingswinford, and Smethwick; and the area of supply is to embrace the whole of this particular "Black Country." We give the details of the "Gazette" notice in another column, where they will doubtless be attentively studied by the curious. For this proposed scheme is a highly interesting survival of the almost prehistoric period when technical persons yet fondly imagined that there might be "something in" the dream of "cheap non-illuminating "fuel gas." It is almost an insult to gas engineers to remind them of the vain tentatives that have been made in quest of this commodity—as something to sell and distribute to a distance. Naturally, the non-expert does not see at a glance why, if it is commercially possible to make and use Siemens gas, Dowson gas, or Mond gas on the spot, for heating and generating motive power, it is commercially impossible to distribute the same descriptions of gaseous fuel. He cannot be expected to understand the technical and commercial significance of the one word "distribution," nor to see in it all the difference it introduces into the problem. The most potent argument with such a person, on such a point, is the simple statement that, notwithstanding the amount of ingenuity and money that has been applied to the practical solution of this apparently simple problem, here and in America, it has never been done. Many fuel-gas companies have been started in the United States; not one is now in existence. Mr. George Westinghouse spent £40,000 on experiments of the same kind, without obtaining other than a negative result—which was perhaps worth the money.

To this flat negative it may be objected that Mond gas is something new, and different from all these gases that failed. In reply, it is enough to say that it is only a semi-water gas made from bituminous coal instead of anthracite or coke. For this reason it contains more residual products; but the gas is no stronger than Dowson gas. That is to say, it possesses a calorific power of about 150 British thermal units per cubic foot, as against 600 British thermal units for ordinary coal gas. It must be burnt in commensurately greater bulk to produce the same effect. How are 4 cubic feet of gas to be distributed for 1 cubic foot, without largely increased expense, to say nothing of any advantage. Are the mains to be four times the sizes or charged at sufficient pressure to pack 4 cubic feet into the space occupied by 1 cubic foot of coal gas at atmospheric pressure? Mr. Bryan Donkin has discussed Mond gas for power generating in the new edition of his book on "Gas, Oil, and Air Engines," in which he remark, that, although the plant is rather complicated, if properly worked, and a good price is obtainable for the bye-products, "it may be said to give power for practically "nothing." As much may be asserted of the blast-furnace, if all the working expenses are charged to the iron. In another place, Mr. Donkin talks of the possibility of selling even the sulphur from this gas, at £8 10s. per ton, to cover the whole cost of the coal and the working expenses. Here, again, it is the sulphur, the paying product, which is supposed to be sent away, not the gas. The latter simply is not worth carrying to any distance. The subject, it will be remembered, of how to make the best use of bituminous slack was discussed at the last Engineering Conference, on the initiative of Mr. W. Foulis. This discussion certainly created the impression that, if it was to be a case of gas making as well as other processes, the superior economy of the Mond system over other methods of carbonization was not to be taken for granted. Transmission, or distribution, it must be maintained, is of the essence of the present parliamentary project; and upon this rock the scheme must split. If the projected undertaking ever starts, within three years it will either be in liquidation or selling 600-unit gas like any other gas company in the district, and no cheaper.

Mr. A. G. Glasgow on the Prospects of Carburetted Water Gas.

The somewhat indignant tone of the letter in which Mr. A. G. Glasgow replies to-day to our recent note on the "cornering" of gas oil in the English market is pardonable in the writer's circumstances. To his complaint that we have never warmly commended carburetted water gas to the affections of British gas managers, we have the easy and obvious answer that such advocacy is none of our business. Mr. Glasgow cannot charge the "Journal," now or at any time, with denying him a fair field; and he must know better than to expect favour. Our recent denunciation, however—if it should be so regarded—was addressed, not to the order of carburetted water-gas engineers (of which Mr. Glasgow is an ornament), but to the dealers in the new raw material of gas manufacture, who appear to have the prospects of this branch of industry entirely at their mercy. The gravamen of our remarks is in the statement that "the oil cornerers have spoilt the "prospects of carburetted water gas for this country." We are pleased, of course, to learn that the improvement of the apparatus and of the character of the oil supply since 1891 has been such as to more than compensate for the advanced price of oil which has so strikingly coincided with the dearness of coal. Let us hope, nevertheless, that Mr. Glasgow's prognostications will prove correct, and that a return of oil to the three-penny rate of 1891 will enable gas makers to rejoice in the whole benefit of the technical improvements referred to. If we were disposed to argue the point, we might say of this prophecy that it really proves our own case; for, if Mr. Glasgow pledges his judgment for it, the circumstance is a strong indication that he heartily desires to see such a result brought about. He must realize that with gas oil at about 5½d. per gallon, which means carburetted water gas at about 1s. 7d. per 1000 cubic feet (the Crystal Palace District Company's figure), this branch of the gas industry of the country is in a precarious state. If he wants to save it, he must attack the "cornerers" of oil. We understand from another source that some oil can be obtained independently by encouraging small importers, especially in the matter of time; but there are no means of ascertaining the extent of this relief.

The Parliamentary Notices for the Next Session.

In another part of the present issue of the "Journal" will be found the completed list of the Parliamentary Notices for next session in regard to gas supply. Although most of the promised Bills are of an ordinary character, some of them will arouse a good deal of interest, not all of a friendly nature. We have already mentioned the legislative proposals of the Gaslight and Coke Company; and it only remains to add that the South Metropolitan Company are

also in Parliament, but merely for powers to acquire the Surrey-side portion of the district of the Gaslight and Coke Company, if Parliament should approve of the transfer. This Bill in no way raises a fresh question of policy; but if it passes it will give the South Metropolitan Company similar powers to those already possessed by their northern neighbours. The Aldershot district is becoming a very populous one in these stirring times; and the Company require further powers. The Bath Gas Company desire to have their statutory facilities brought up to date; and the British Gaslight Company want to enlarge their Hull undertaking. The Chester Gas Company are in the same case as the Bath Company; and a like observation applies to the Companies in Devonport, Dorking, Dover, Elland, Richmond, Newcastle and Gateshead, Shrewsbury, Weston-super-Mare, and several smaller towns.

The Devonport Corporation desire to purchase the undertaking of the Company; and the District Council of Colwyn Bay have similar aspirations. At Hartlepool, a Joint Board purchase scheme is on the stocks. Gravesend is to ask for a reduction of illuminating power from 16 to 14 candles; and several other notices may cover the same design. Dover contemplates municipalizing the gas and electricity supply. An old limited Company—the Leatherhead—will seek statutory rank. Portsea, Pinner, Slough, and Woking, with other undertakings, are applying for Provisional Orders. Only one Irish application—from Omagh—appears in the notices; but it will be seen that the new Scotch Private Bill procedure comes into operation for the first time. Henceforward all Scotch business of the kind will be in the shape of Provisional Orders, and will be dealt with under the Act of 1899. Dundee and Kilmarnock join with Glasgow in proposing to reduce the illuminating power of their gas. These applications will be an easy introduction for the new system of legislation, inasmuch as they are not likely to be opposed strongly, if at all. It will be better for the new arrangement to feel its way with unopposed Bills at first.

A Coal Contract Custom.

The case of *La Société Anonyme l'Industrielle Russo-Belge v. Scholefield*, decided in the Commercial Court of the Queen's Bench Division on the 23rd ult., is of interest to gas companies as determining a question of custom in the coal trade. The action was brought to recover damages from the defendants for alleged breach of two contracts under which plaintiffs purchased, in April and October of last year, "about" 10,000 tons of Northumberland steam coal and "about" 8500 tons of Northumberland duff coal for delivery to Antwerp. Defendants having only delivered 9592 tons and 8453 tons under the respective contracts, plaintiffs claimed damages on the ground that the defendants should have delivered the balances—equal to 455 tons. Prices having risen considerably since the contracts were entered into, the undelivered quantities could only be bought at enhanced cost to the plaintiffs. Defendants pleaded that, owing to the introduction of the word "about" into the contracts, they were given a moderate and reasonable latitude in the performance of the contracts; and they relied upon a custom of the coal trade, by which the word "about" in such a case is interpreted as allowing a margin of at least 5 per cent. in quantity either way. Mr. Justice Mathew, having heard evidence in support of the existence of the custom, gave judgment for the defendants—stating that he was satisfied that the word "about" in such contracts had the customary meaning ascribed to it, and that the vendors were entitled to the advantage of shipping more or less than the specified quantities (within a margin of 5 per cent.) according as the state of the market made it desirable for them so to do. There is little comment to make upon this judgment; but it is one that may be noted for the guidance of coal buyers, who will be well advised to see that their contracts contain more specific terms where large quantities are involved. We should say that, generally speaking, the term "about" is to be found more frequently in agreements for the purchase of single cargoes than in contracts for extended periods.

Another Check to Progressivism.

The ebbing of the tide of Progressivism in civic affairs continues. Last week the triennial election of the London School Board was held; and, notwithstanding the frantic endeavours of the newspapers identified with the Party to drum up votes for its candidates, the aggregate Progressive poll fell off by 157,000. The system of this School Board election is peculiar. The constituencies are very large; and the voting is cumulative. Under this arrangement, the individual voter feels that his share of power is so infinitesimal that he does not care to vote at all, unless he happens to hold strong opinions on School Board questions—which is only the case with a very small minority. Besides, the constituencies are so unwieldy that the pretence of local representation is a farce. Nobody knows who the candidates are; and hardly anybody cares. The British public only appreciate broad political issues. When once a clear dividing-line has been drawn between opposing policies, the British public will take sides and make their power felt. We all know what happened at the Parliamentary election; and the same thing was repeated at the recent Metropolitan Borough elections. In the case of the School Board election, however, there was no such plain issue; though some of the candidates published their connection with the Progressives of the outside political world. They usually suffered for it.

Progressivism on the School Board is not exactly the same as Municipal Progressivism; being professed, in the educational field, by some good and true servants of the public who are not politicians. Still, the name has become unpopular with Londoners, as being mixed up with faddism, socialistic folly, and extravagance. Some of the most hopeless blockheads in public life pass for Progressives, because Socialism is the easiest of doctrines to prattle, and there is no fear of its ever coming to anything. It is far more difficult, and pays less in newspaper advertisement, to strive after practical efficiency at the cheapest price. The national system of public elementary education has disappointed the hopes formed of it at first, largely because its direction has been confided to the wrong hands. The ordinary ratepayer has no confidence that the election of a new School Board will mend matters; and therefore he stays away from the polls. 'Tis a mad world! The British Empire has been pouring out blood and treasure like water, because certain people domiciled in a part of South Africa were deprived of votes and had no voice in the direction of scholastic affairs. In London, and all over the Kingdom, the trouble is of the opposite kind—the people who have votes will not take the trouble to use them.

Some Experts' Views of Municipal Trading.

The question of Municipal Trading was recently discussed in the "Engineer," and also in the "Engineering Maga-"zine." It is significant, by the way, how utterly unsympathetic with regard to this principle are most of the best organs of specialist opinion. Its really blatant advocates are the most trumpery of the daily and weekly papers, which are not worth taking seriously on any subject except (say) horseracing and football. Municipalities, remarks the "Engineer," might as logically provide all the necessaries of life and do all the industrial work of a district, as limit themselves to such matters as electricity supply and gas lighting. The usual plea, that local authorities ought to have the command of their own streets, is, our contemporary shows, not devoid of reason; but the argument founded upon it is out of proportion. The pulling up of streets, or rather the difference of inconvenience to the public due to the streets being pulled up by one body or another, is too minute in comparison with the important question of municipal or private ownership of a supply system to be allowed to weigh down the balance. We are reminded in this connection of Mr. Livesey's statement to the Municipal Trading Committee, that if municipal workmen did not earn their money more honestly than seemed to be their present habit, it would be better for the public that companies alone should touch the pavements.

The "Engineer" proceeds to explode the pretension that local authorities can get money cheaper than companies. What with interest and the redemption of loans, this is not true; but, in any case, it is wrong to claim such an advantage, because the security is not the same in each case. Shareholders get a dividend, or not, as their fortune is. Ratepayers, on the other hand, always pay interest, no matter whether the investment is a profitable one or not. "There is little doubt the company in reality gets its "money cheaper." To the oft-heard claim that municipal trading undertakings are successful, our contemporary answers: "We do not know; it is very much a matter of "account-keeping."

Mr. W. H. Booth, writing in the "Engineering Maga-"zine" on the same point, comments bluntly on the decision

of the House of Lords Committee last session that a particular corporation tramway should pay no profit, but expend all its surpluses in reducing fares. This order, he observes, was no doubt intended as a check on the worst fault of municipal trading. "It opens a door, however, "for an abuse that has been all too common in municipal "affairs; for it will tend towards the payment of excessive "prices for stores and other materials . . . there will "be very little difficulty in making no profit." This is unkind; but it needed saying by somebody.

The True Cause of the Trouble at Bethesda.

THE development of the Bethesda quarrymen's strike is well worth following, as an object-lesson in the active operations of militant Trade Unionism. Readers of the "JOURNAL" may be supposed to know pretty well which side, in any industrial dispute, is more likely to tell the truth, and will not believe very easily that the owner of any valuable mineral rights which are in course of realization has a prejudice in favour of shutting down the works without sufficient cause. The fact is that the usual stock reproaches about the grasping capitalist, the hard taskmaster, and so forth, are so obviously inapplicable to the present case, that the hack newspaper writer to Trade Union prompting has been sorely put about to find another stick wherewith he may belabour the Bethesda management. The "Daily News" has afforded some choice entertainment in this way. The Editor sent somebody down to the quarry to obtain "accurate information"—that is to say, some positive confirmation for the preconceived notion that in industrial disputes the men are always in the right and the employers in the wrong. The mission was not a conspicuous success. Skimming quickly over the several breaches of the peace with which the new outbreak began, the reporter was compelled to fill his notebook with descriptions of the reluctance of the strikers to leave their homes, and so forth. He had an interview with Mr. Young, Lord Penrhyn's Manager, and recorded his innocent amazement at the discrepancies between this gentleman's story and the men's statements. Not one word of the true rights of the matter was allowed to find publicity through this source. Lastly, from another report we get the following significant declaration: "This "quarrel has been forced upon us; and we shall never "yield as long as the right of combination is denied to us. "If Lord Penrhyn will recognize the Union, the quarries "may be opened to-morrow." It is not difficult to perceive from this artlessly contradictory statement where the tyranny lies. Mr. Young declares that the management neither know nor care who among the men belongs to a Union; but they will not have Union subscriptions collections in the quarry during working hours, nor accept Union dictation as to how the undertaking is to be carried on. So the matter stands. It is a quarrel over "recognition," of the familiar kind; and there is nothing for it but to fight it out.

WATER AND SANITARY AFFAIRS.

THE further list of notices of intended applications to Parliament in connection with water supply which appears elsewhere, taken in conjunction with that given last week, furnishes a complete presentment of the schemes which will be more or less before our readers in the course of the next nine months. Endeavours will be made by the Local Authorities of Aldeburgh, Broadstairs, Dorking, and Wells, among other places, to obtain possession of the water supply—in the first-named case in accordance with the terms of an agreement. The Dorking Urban and Rural District Councils are both concerned in the acquisition of the local water-works, and if they succeed they will carry them on jointly or separately. There may possibly be a tussle in Wells, as the Water Company are applying for incorporation. The largest scheme for extending existing works is that of the Leeds Corporation, referred to last week; but those of the Barrow, Harrogate, and Ripon Corporations, and the Kettering District Council, are of some significance. More time will be applied for by the Edinburgh and District Water Trustees for the completion of works already sanctioned; and an enlarged area will be sought by the Wolverhampton Corporation. A new Company is to be formed for the supply of Oakham; and incorporation will be asked for by the Faversham and Swanage Companies. An attempt will be made by the Local Authorities of Ilkeston and Heanor to form a Joint Water Board to acquire the water undertaking in their district. The applications for Provisional Orders are not very numerous. Certain private parties at Bearsted and Hungerford are desirous of being invested with legislative authority to supply water; and other applications relate to extensions of limits or increase of capital. The proposals do not appear likely to cause much opposition.

However tranquil may be the progress of the measures above referred to, that of the Stockport Corporation, should it ever get into Parliament, will certainly not be particularly smooth, judging by what has lately transpired in the town. We mentioned in the last number of the "JOURNAL" that the proposal of the Corporation to carry out a large extension scheme in connection with their newly-acquired water undertaking had given rise to some indignation among the ratepayers, which had found expression in some letters to the local papers. Last week it burst out with tremendous force. On Tuesday afternoon, the Town Council had a special meeting to consider the formal resolution sanctioning the promotion of a Bill to carry out the scheme, the cost of which is estimated at £820,000. But it was by no means formally passed. Complaints were made that full details had not been furnished, and that the whole thing had been "sprung" upon the Council, and was being "rushed through." It must be acknowledged that, inasmuch as the proposal was not submitted until the end of October, and then only in a crude form, and not brought up for public discussion till the 27th of November, there was some justification for the complaints. In fact, on this matter as on the question of purchase the Council appear to have been kept somewhat in the dark. Before the acquisition of the works, a member of that body raised his voice against the Corporation embarking upon an undertaking which would involve an immediate expenditure of £800,000—more than the Government had paid for an empire during the preceding twelve months—without a single opportunity being afforded for the matter to be fully considered. The purchase, however, was duly sanctioned by the ratepayers.

This was done in the belief that the works and sources of supply would be adequate for some years to come. Now the town is suddenly called upon to face the large outlay above alluded to; for Mr. Mansergh, who is advising the Corporation, told the Council plainly last Tuesday that they must go immediately to Parliament for authority to construct new works—in fact, that they ought to have included them in their Purchase Bill of last year. He warned the Council that the Water Committee would have "a terribly trying time," and their Manager "all his work set out," to keep up the supply during the eight or nine years required for the construction of the reservoir he proposes to make at Kinder; and he added that it would be the "supremest folly" to refrain from getting the necessary powers next year. A suggestion was made that no proceedings should be taken until another and "experienced" (!) water-works engineer had been appointed to examine other schemes. But it only found six supporters; while the resolution had six times as many. Shortly after this decision was arrived at, the resolution was submitted to the ratepayers at the statutory public meeting. It was very warmly discussed for about three hours without result; the Mayor adjourning the proceedings for a fortnight, in face of the expressed opinion of the Town Clerk that any postponement beyond a week might be detrimental to the Bill. The interval will, however, allow of fuller consideration of the scheme and of the position generally. The issue before the ratepayers, as the Mayor put it, is simply this: They must have water, and they cannot go on until such time as they absolutely need it. They must look ahead. The most eminent Water Engineer in the country urges immediate action; and it seems to us that the best course will be to follow his advice. The cost will be heavy; but if the outlay is necessary for the welfare of the town, there should be no hesitation in incurring it. The Corporation have got possession of the water-works; and they must do the best they can with them.

The Water Committee of the Coventry Corporation have lately been considering the subject of the prevention of waste; and, with the view of obtaining statistics and other particulars to help them in their investigation, a deputation visited Birkenhead, Bolton, and Blackburn, where they

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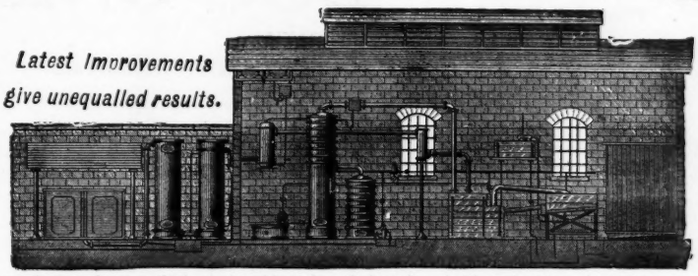

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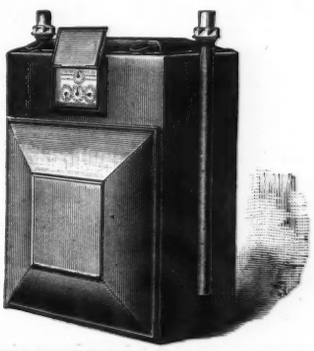

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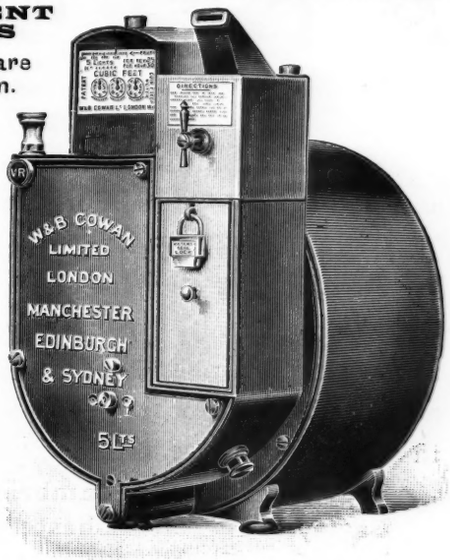

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had opportunities of seeing the Deacon meter in operation. In the first-named town it was introduced in 1882, with the result that the consumption has been brought down from 24 to 17·84 gallons per head. The capital outlay was £4600, against which there was a saving of £1000 a year. Only eight day and four night inspectors are employed. The Committee came to the conclusion that if the consumption in Coventry could be reduced to the Birkenhead level, the saving would be 416,500 gallons per day, or equivalent to an annual economy of £500. The water saved (6½ gallons per head) would supply an additional population of 14,800, and would, according to Mr. Hawksley's estimate of the increase, carry the city on for twenty years or more with the present area of supply, or for ten years with an added area. The Corporation at once decided to make a trial of the meter. The introduction of the waste-water meter at Coventry has not entailed a very large outlay; and, as inspection is a part of the new system, it will be interesting to watch the results. If the saving turns out to be what is promised, it will have been a highly beneficial step to have taken.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1411.)

AGAIN last week the course of business on the Stock Exchange was irregular; the markets being swayed from time to time by varying, if not conflicting, influences, which produced fluctuations. Taken generally, the markets were a little busier; but the fortnightly settlement was not without its effect. In the earlier portion of the week, the tendency was good, and all in favour of rising prices. But then a check set in, and there was a marked disposition to realize profits; so that thenceforward things were weaker and somewhat irregular. Outside the American Market prices in general closed easier; and the Funds and the gilt-edged division as a whole had their full share of depression. The Money Market was pretty stiff until after the settlement and the close of the month, when rates slackened off perceptibly. In the Gas Market, business was decidedly quieter, and no marked feature was prominently conspicuous. Upon the whole, the general tendency may be written as fairly firm, although movements were not uniformly in the upward direction. Still, the one or two retrogressions which chequer the list were not of chiefest importance. In Gaslight issues, very moderate business was done in the ordinary, which changed hands daily at prices between 97½ and 98½, without any sign of a tendency to stray outside. But there was some little demand for the debenture stock; and the quotation advanced a point. South Metropolitan continued on the rise, and gained another point, marking top price. The few transactions recorded in Commercials pointed to a continuance of its long standing firmness. The Suburban and Provincial group were almost as devoid of business as ever, and nearly without movement. British, however, recovered a point. The Continental division was remarkably quiet, but fairly steady, if it had not been for a drop in European. Among the remoter gas undertakings, Monte Video relapsed, but Oriental advanced on the *ex div.* quotation. The Water Companies had their usual quiet time; the most noticeable feature being an inquiry for their debenture stock. Some further advances were made by two or three issues, while Southwark went the other way.

The daily operations were: Gas stocks were quiet on Monday, and remained firm at opening prices; quotations undergoing no variation. Tuesday's transactions were just as limited; but British rose 1, and the debenture stocks of Gaslight and South Metropolitan did the same. In Water, West Middlesex rose 2½; but Southwark fell 1. No greater activity was developed on Wednesday; but all were steady, while South Metropolitan gained 1. Thursday was a shade more lively; but Monte Video receded ½. Friday fell quieter; and European part paid was ½ lower. In Water, New River rose 2, and East London debenture 1; but Southwark fell 2. Saturday was quiet, and unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Shoreditch Vestry and their "Duplex Toy"—The Electrical Promoter again in Evidence—Fire and Life Risks of Electric Fittings.

THE notorious Shoreditch Vestry electricity supply *cum* dust destructor plant has again engaged the attention of the analytical accountant of the "Electrician," and also of the "Engineer," on the occasion of the publication of the third year's accounts. A year ago, the Vestry Committee gave an undertaking that for the future the accounts relating to electricity generation and dust destruction should be combined, in order that the ratepayers might be able to understand better how the splendid enterprise of their Vestry was working out. It was not pretended that the accounts were intelligible on the old basis. Now the alteration has been effected, it will be a source of intense gratification to the amateurs of this kind of municipal trading to learn that neither the "Electrician" nor the "Engineer" is able to make head or tail of the statement, regarded as a guide to the actual condition of affairs. The former critic is driven to employ such words as "presumably," and "it does not appear," in his endeavour to ascertain the financial relations of the dustcart and the dynamo; but he is early obliged to confess that "to define fairly the reciprocal relations of the electricity and destructor departments is difficult, if not impossible." So that municipal book-keeping has triumphed once more in the noble effort to conceal results. All that the accountancy of the "Electrician" amounts to in this regard is the disclosure that an apparent working profit of 7·47 per cent. for 1899 has fallen to 4·33 per cent. for 1900. The critic of the "Engineer" is disappointed "at the paucity of the information that is available for consideration on the present occasion." He finds, chiefly, that the Vestry have spent £170,383 on their duplex toy; and, further, that the accounts are remarkably reticent as to the extent to which the refuse destructor helped the coal-store. "In fact, the absence of any details concerning the actual financial position of the destructor tends to disarm, if not prevent, a proper criticism of the joint undertaking for the past year." Next year, let us hope, the Local Government Board Auditors will be able to wipe off this scandal of "Progressive" book-keeping.

The electrical company promoter is incorrigible. He is always ready to jump, like the Old Man of the Sea, upon the back of any and every kind of electrical trading enterprise that appears to be finding its feet; and he can rarely be dislodged until the whole thing is crushed to earth. We have repeatedly argued here that one of the chief objections to the vague beginnings of electric power generation in bulk, and electric traction, is the opening it affords for company-mongering. Quite suddenly, during the past few days, we have been forcibly reminded of these forebodings by an outbreak of prospectuses of the "British Electric Street Tramways, Limited." It is unnecessary to describe the contents of these prospectuses in detail. They are stuffed, in the usual way, with references to the working of other concerns, and gilded with some names that seem sadly out of place. The "Electrical Review" of the 30th ult. reproduces all the particulars, and then adds the comment: "When such an astounding proposition can be put before the public, how can the electrical industry flourish? We can only hope that not 200,000 pence will be subscribed towards this preposterous demand." Our contemporary's City Editor is contemptuously sarcastic over the issue; saying that "it is difficult to imagine that there can be anybody simple enough to apply for shares in such a Company." After this, it might be considered libellous to repeat the names of the eminent electricians with which the front page of the prospectus is embellished.

There is evidence to the effect that the electricians who are responsible for the working of central supply stations, and those who are naturally interested in the fair fame of household electric light fittings, are becoming seriously uneasy in regard to the frequency of electrical fires and accidents to the person. The other day, a leading electrical journal laboriously attempted to poke some carefully-manufactured fun at those who dread electrically-caused fires. This was in respect of an alarming outbreak of fire at a Regent Street photographic studio, which was explained at the time by reference to the enormous consumption of current necessitated for working a photographer's business by electric light. Our contemporary's laughter was slightly hysterical, probably because of its knowledge that the modern fashion of distributing electricity at the maximum pressure permitted by law is something which may yet be found to cover some unpleasant surprises in the way of shocks and fires. Meanwhile, there is a continual occurrence of very nasty switchboard and live-wire "accidents," which, as an observer of the record very pertinently remarks, are monotonously ascribed to the fault of the individual sufferer. The man who is killed is invariably alone to blame. This is the almost inevitable Coroner's conclusion from the evidence, which is always to the purport that preventives and safeguards were provided, but not used. It is marvellous to the practical man how easily Courts of Law, from the lowest to the highest, are persuaded to give a rigid interpretation to the consideration of this matter of guards and protectors. If an employer cannot prove that every bit of moving machinery was securely fenced, he is held liable for every accident that may occur in connection with that machinery. The circumstance of the workman having perhaps knocked away the fencing for his own convenience, or having neglected to complain of the dangerous state of the machinery, is never regarded as absolving the proprietor. Similarly, it is usually sufficient to prove that a workman in an electric lighting station had india-rubber gloves to wear about his work, if he had chosen to use them, for a jury to find that it was his own fault if he met his death from electric shock. Another famous precaution in such cases is an india-rubber mat to lie in front of the switch-board. Even the Board of Trade appear to believe in the virtue of the mat. All these things, however, are likely to prove snares. Mr. Ferranti years ago propounded the only perfectly safe rule for the avoidance of shocks—that it should not be physically possible for any human body of ordinary dimensions to bridge over the distance between two naked conductors at dangerous differences of potential; but this rule has been treated as a counsel of perfection.

BENZOLIZED WATER GAS AT ERFURT.

It will be fresh in the memory of readers of the "Journal," that Professor Vivian B. Lewes, in the course of his lecture to the Institution of Gas Engineers last May, on "Water Gas and its Recent Continental Developments,"* dwelt on the great merit of the system of using water gas for admixture with coal gas which had been introduced at the Erfurt Gas-Works. Thanks to the courtesy of Herr G. Martin, the Manager of the works, we are able to give to-day two photographic views of the water-gas plant—one (fig. 1) showing the generator with doors for clinkering and connections; and the other (fig. 2), the working stage with the operator at work, and the analyst making tests of the gas with Bunte burettes. Herr Martin has also kindly favoured us with a plan and elevations of the plant from which the illustrations on pp. 1396-97 have been prepared. The system of working adopted at Erfurt will be readily followed by reference to these figures.

Water gas is produced by the Dellwik-Fleischer process, which has been several times described in our columns. This system differs essentially from the common process in that the fuel in the generator is raised to incandescence by the combustion of a part of it by means of an excess of air, which is introduced at very high pressure; and the product of the combustion of the carbon of the fuel is, under these conditions, carbonic acid, in place of carbonic oxide, which is the chief product of the "blows" in the common water-gas process, in which the carbon of the fuel is generally maintained in excess of the air. The heat produced in the generator for a given consumption of fuel is consequently about three times as great in the Dellwik-Fleischer as in the common process; and therefore the fuel is raised to the proper temperature for decomposing steam in order to produce good water gas, with "blows" of about one-third the duration of the "blows" to which we are accustomed in working the common system. So far as the production of simple ["blue," or "straight"] water gas is concerned, the economy of fuel and time which these figures indicate is realized as net gain; but when there is employment for the large volume of producer gas which is formed during the "blows" in the common process, the latter may, for the particular purpose, be every whit as economical as the Dellwik-Fleischer system.

In the latter, the fuel used up in the "blows" is completely consumed in the generator, and only the sensible heat of the hot spent gases escapes from that vessel. The gases given off during the "blows" are truly "spent," or incapable of yielding more heat by a more complete combustion. The generator has had the benefit of the whole of the heat of the fuel consumed in the "blows." In the common water-gas process, however, the generator fuel which is consumed in the "blows" is not completely burnt *in situ;* the carbon of the fuel is carried away in the gases produced, in the form of carbonic oxide, and these gases constitute what is ordinarily known as producer gas. The carbon of the fuel contained in them in an incompletely burnt state—*i.e.*, as carbonic oxide—can be conveyed to a neighbouring vessel or kiln, and its combustion completed by means of a further supply of air. In other words, if heat is required for any purpose in a vessel or kiln near the generator, it may be economically obtained from the producer gas which is formed during the "blows" in the common water-gas process. The whole system of generator and kiln is then capable of utilizing the fuel supplied to the common type of water-gas generator quite as effectively and economically as the Dellwik-Fleischer generator utilizes the fuel supplied to it merely in the production of simple water gas. In the common water-gas process, only a part of the heating value of the fuel is utilized in the generator; but the balance is available for utilization in any adjacent plant where heat is required, while in the Dellwik-Fleischer system the whole of the heating value of the fuel is utilized in the generator, and none is available for external work. In this argument, it is necessarily assumed that the water gas produced in the generator is not available for immediate consumption in the adjacent plant in which the producer gas can be utilized.

This somewhat tedious explanation indicates the reason why the Dellwik-Fleischer water-gas plant—which is admittedly superior to earlier apparatus for the production of simple or "blue" water gas—has not superseded the Lowe type of carburetted water-gas plant, as exploited in this country by Messrs. Humphreys and Glasgow, the Economical Gas Apparatus Construction Company, and Messrs. S. Cutler and Sons. Under ordinary conditions of working, and especially when the proportion of oil gasified to the coke consumed in the generator is not too low, this type of carburetted water-gas plant utilizes the heating value of the coke used as economically as does the Dellwik-Fleischer plant, though in a different direction. Heat is required for the gasification of the oil used; and it is obtained conveniently and economically from the producer gas which is formed during the "blows." Hence, wherever water gas has to be "carburetted" by the cracking of oil, the Dellwik-Fleischer system is not superior to the improved Lowe process. But in Germany and other countries where suitable oil for cracking is not obtainable at a reasonable price, by reason of heavy import duties on petroleum, or from other causes, there has lately been

* See "Journal," Vol. LXXV., p. 1194.

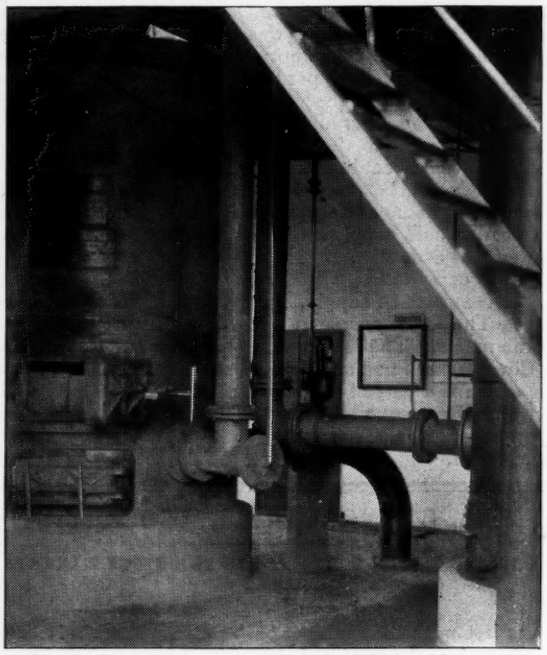


Fig. 1.

adopted a system of carburetting, by means of the vapour of readily volatile hydrocarbons, which admits of full advantage being taken of the special economy of the Dellwik-Fleischer method of producing water gas. This system of carburetting water gas, made by that method, by means of benzol vapour, is in use at Königsberg, Erfurt, and elsewhere, as Professor Lewes pointed out on the occasion already referred to. He also emphasized the fact—which was clearly made out in a series of articles on the "Enrichment of Coal Gas" in the "Journal" in September and October, 1897—that benzol was superior to fatty hydrocarbons for such a purpose, as it possesses nearly four times as high an enriching value as carburine.

Now it has been often shown that simple water gas is, by itself, a bad basis for an illuminating gas. Practically, a quantity of benzol vapour or other illuminating hydrocarbon must be added to it before it begins to afford a flame having an appreciable luminosity. In other words, it does not respond at once to the addition of a carburetting agent. In carburetted water gas made by the Lowe process, the gaseous constituents derived from the oil neutralize this lack of efficiency of simple water gas as a foundation of illuminating gas; and there is not a great initial expenditure of illuminating hydrocarbons before the gas responds normally to their carburetting action. There is, however, some measure of loss in this direction, for carburetted water gas always contains a higher proportion of illuminating hydrocarbons than does coal gas of the same candle power; and as the hydrocarbons are very similar in nature and relative proportions in the two gases when both are made at the high temperatures now in vogue, the difference must in reality be due to the different nature of the diluent or non-illuminating constituents of the two gases. It is unnecessary, on this occasion, to enter on a discussion of the reasons for this different effect of the diluent gases of carburetted water gas and coal gas. They are now apprehended tolerably exactly, and were touched upon by Professor Lewes in the lecture already mentioned. But in any consideration of the enrichment of coal gas, the broad facts alluded to above must not be ignored; otherwise we shall commit the fallacy of supposing that a mixture of (say) equal volumes of 16-candle power coal gas and 16-candle power Lowe carburetted water gas has not a higher illuminating power than 16 candles. Anyone who is dubious of the value of Lowe carburetted water gas as an enriching agent, or of coal gas as a basis, should make observations of the illuminating powers of the two gases of as nearly as possible equal candle power, and of a mixture of the two.

Hence, it seems that simple water gas is not to be commended as the basis of an illuminating gas if coal gas can be made at about the same cost. It requires too great an expenditure of carburetting material, in order to convert it into an illuminating gas. But it may usefully be either slightly carburetted with benzol and then added to a greater volume of coal gas, or it may be added to coal gas and the mixture carburetted with benzol. The first plan is practised at Königsberg; and as Professor Lewes has pointed out, an addition of less than 20 per cent. of 9-candle power benzolized water gas to 16-candle coal gas, gives a mixture of over 17-candle power. Such a result, having regard to the cheapness of benzol, and the fact that only about 0·14 gallon is required per 1000 cubic feet of the mixture, may seem so satisfactory that it would be futile to seek means

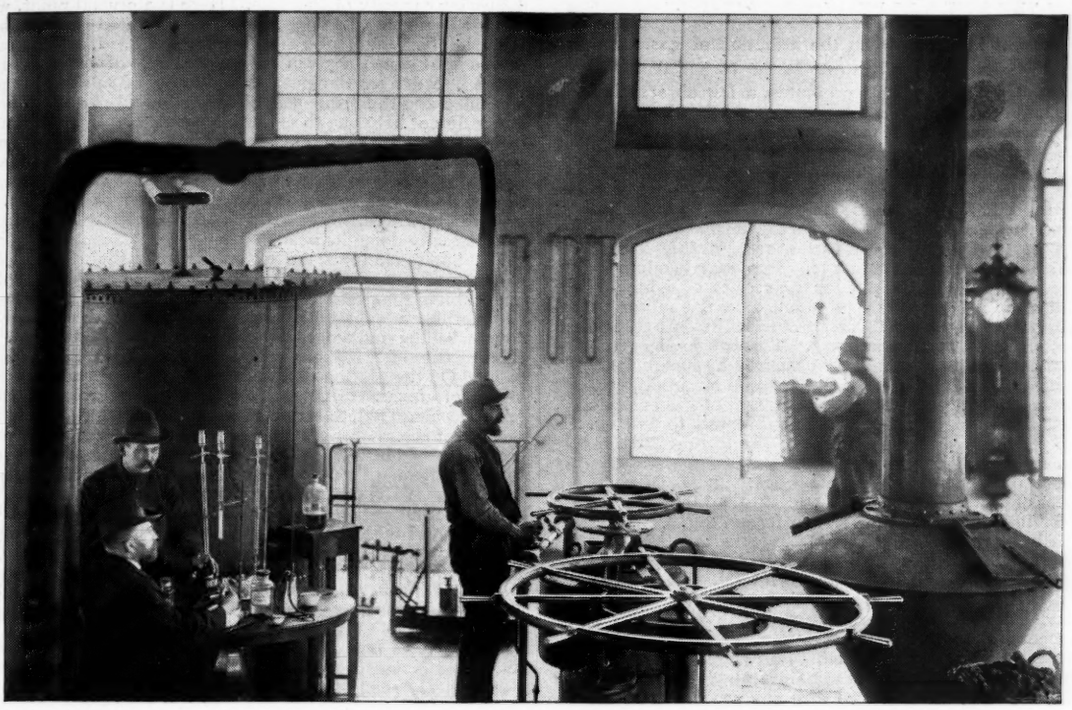


FIG. 2.

whereby it could be improved upon. But if, instead of adding benzolized water gas to coal gas, simple water gas is added under certain conditions to coal gas and the mixture is benzolized, a greatly improved result is actually attained, as the Erfurt trials have shown.

The water gas is made at Erfurt in the Dellwik-Fleischer generator, of about 9000 cubic feet productive capacity per hour, shown in the illustrations. The plan and elevations show clearly the general arrangements of the plant. A boiler working at a pressure of 60 lbs. per square inch supplies steam to the generator through a 2-inch steam-pipe, and also drives the fan by which the blast of air for the "blows" is obtained. The air-inlet pipe is 12 inches in diameter. The generator is provided with reversing valves, to admit of the runs being made either from bottom to top or top to bottom, and with a closed charging hopper, which will appear an innovation to those familiar only with the English or American forms of generator. The top of the generator-shaft is provided also with a spark-catcher, which is, of course, more necessary than with the Lowe carburetted water-gas plant, owing to the facts that the blast is under higher pressure and that the shaft issues directly from the generator, and consequently the spent exit gases do not traverse checker-work chambers in which sparks would be deposited. The water gas passes from the generator to a scrubber, and thence by a 12-inch main to the relief gasholder, which has a capacity of 21,200 cubic feet. From the gasholder, the water gas flows through an 8-inch main to the station-meter, and thence by 8-inch connections to the foul main of the retort-house. It there mixes with the crude coal gas, and the mixture passes through the usual plant to the station-meters. An exhauster, driven by a 2-horse power gas-engine, is provided in case it may at any time prove desirable to force the water gas direct from the relief gasholder to the coal-gas main at the inlet to the purifiers, instead of passing it through the foul main of the retort-house. Up to the present, however, this method of working has not been applied; and the exhauster has therefore not been used. Connected with the 24-inch main which conveys the gas from the meters to the holders, is a carburettor of the Leybold pattern, by means of which the mixed gas is carburetted with benzol to the customary illuminating power of about 16¼ English candles. The arrangement of the mains and valves will be readily understood from the illustrations given.

The results of the working of this scheme at Erfurt cannot yet be given with any certainty, as the plant has not been long at work, and will be used continuously and under normal conditions for the first time this winter. These particulars will be awaited with the greatest interest. In the meantime, we may glance at the results of preliminary work as given by Professor Lewes. Putting aside the problematical figures as to the cost of production of coal gas, water gas, &c., and looking only at the quantities of benzol used at Erfurt and elsewhere for a given degree of enrichment, we shall be able to see what is the extent of the economy which is claimed for the Erfurt system.

At Erfurt, according to Professor Lewes, 1 gallon of benzol brings the illuminating power of a mixture of 7500 cubic feet of 16-candle power coal gas and 2500 cubic feet of simple water gas to over 16 candles. Thus 2500 cubic feet of non-illuminating water gas is given an illuminating power of over 16 candles. At Königsberg, also, according to Professor Lewes's figures, 7200 cubic feet of mixed gas, consisting of 16-candle coal gas to which 17 to 20 per cent. of benzolized water gas has been added, has an illuminating power of over 17 candles, and 1 gallon of benzol has been used in benzolizing the water gas. Now the volume of benzol vapour will be relatively quite small, and the mean proportion of simple water gas in the mixture may be taken at 18 per cent. Hence the 7200 cubic feet of gas carburetted by means of 1 gallon of benzol will consist of about 5900 cubic feet of coal gas and 1300 cubic feet of water gas. But since the illuminating power of this mixture is over 17 candles, about one-fifth of the gallon of benzol will have been required merely to bring the gas from 16 to 17 candle power. Hence four-fifths of a gallon of benzol impart to 1300 cubic feet of non-illuminating water gas an illuminating power of over 16 candles. At Erfurt, 1 gallon of benzol gives an illuminating power of over 16 candles to 2500 cubic feet of water gas; at Königsberg, to only about 1600 cubic feet. Therefore the Erfurt system appears to give a net gain represented by 900 cubic feet of non-illuminating water gas being converted to 16-candle power gas, for every gallon of benzol used or every 10,000 cubic feet of mixed gas made. This is on the assumption that Professor Lewes's figures are correct for both cases, though it should be added that they display some inconsistencies and are, for Erfurt at least, based only on preliminary trials. The 900 cubic feet, or thereabouts, of water gas must evidently have had illuminating quality imparted to it by vapours which otherwise would have been condensed and deposited in the coal tar. Now something over half-a-gallon of benzol would appear, from the Königsberg figures, to be required to give an illuminating power of over 16 candles to this 900 cubic feet of water gas, which is associated, in the mixed gas, with 7500 cubic feet of coal gas and other 1600 cubic feet of water gas. Hence the tar obtained in the manufacture of 7500 cubic feet of coal gas must yield to the 900 cubic feet of water gas over half-a-gallon of benzol, or the equivalent thereof in illuminating duty. But the 8 gallons or so of tar which would be obtained in the manufacture of 7500 cubic feet of coal gas would yield, in the hands of the tar distiller, more nearly half-a-pint than half-a-gallon of benzol. Probably there is a considerable loss of benzol from the tar before it reaches the tar distiller; but the difference is too great to be wholly accounted for in this manner. Actually, it seems that the Erfurt practice of introducing water gas into the foul main, and benzolizing the mixed gas to the required degree, results in an economy of enriching material (benzol) which is greater than can be accounted for by the retention in the gas of all the benzol and similar vapours which ordinarily would be condensed and deposited in the tar. We shall await with the greatest interest the report of actual working results at Erfurt and other places where benzolizing processes are in operation, in the hope that some explanation may be afforded by them of this apparent anomaly.

In the meantime, we must congratulate Herr Martin on having introduced a scheme which is undoubtedly a success, whatever its underlying principles may prove to be.

WHAT IS THE MAXIMUM DELIVERING CAPACITY OF MAINS?

At the present juncture, when the attention of gas engineers is being powerfully attracted towards the technical novelty of town's gas distribution at high pressures, a few observations on the physical science of the subject may not be thrown away. Indeed, unless students of the elements of gas manufacture, and practical men unread in the theory of the subject, are careful to distinguish the truths of the matter, it is possible that they may conceive quite erroneous ideas respecting the purposes and possibilities of high-pressure gas distribution. To begin with, it is necessary to bear in mind the different objects which the distribution of town's gas at pressures considerably above the normal may be required to subserve. These are two in number. High pressures may be desired for the service of a high-power incandescent lighting system, in which case the minimum requirement of the system in this respect fixes the datum to which the distributing engineer must work. This is a purely mechanical question; and its solution is not affected by economical considerations. That is to say, for the purpose of actuating these high-power gas-lights an increased pressure of gas is essential, and must therefore be provided without regard to its cost. If the high-pressure gas costs more than the low-pressure supply —within reason, of course—this is not the consideration that determines the acceptability of the whole thing. Of course, if the excess of cost, or the trouble and risk, of a high-pressure gas supply for intensified lighting were extreme, the whole system would fail to commend itself to the judgment of the technical and general public. It is the essence of the claim to permanent success made on behalf of the modern intensified gas lighting systems, that the necessary high-pressure gas supply can be safely and efficiently provided, at a reasonable, though still an extra expense, and without real difficulty.

The second object for which high-pressure gas distribution may be proposed is of a different nature altogether. It is that of saving expense, as compared with the usual and customary transmission of gas through pipes at low pressures, by making pipes of the same size carry more gas. One of the strong partisans of this way of transmitting and distributing gas is Mr. Frederick H. Shelton, of Philadelphia, whose important memorandum on the subject, contributed to the International Gas Congress in Paris, was published in the "Journal" for Sept. 25 last. Mr. Shelton is the pioneer in this particular development, which is described by himself as consisting in the supply of a town with gas directly from a high-pressure main through regulators, from a point nearly 5 miles away, without the use of a holder or any storage receptacle.

Older examples of relatively high-pressure gas transmission—distinguishing this operation from distribution—exist in the trunk mains from Beckton, which feed the district gasholders of the Gaslight and Coke Company. Originally designed to work at ordinary low pressure, the exigencies of the undertaking have led to the driving pressure being continually increased, until we understand that it occasionally attains 48 inches of water, which is about 1·75 lbs. per square inch. The usual driving pressure is about half this figure. In a paper read before the Institution of Gas Engineers, in 1898, and given in the "Journal" for June 21 of that year (p. 1446), Mr. Fletcher W. Stevenson described a similar arrangement in use in Sheffield; and in the course of the discussion on the paper, Mr. George Livesey and Mr. C. C. Carpenter described what had been done by the South Metropolitan Company in the way of increasing the delivery of gas from a district feed main by "boosting" the gas into it under increased pressure at the originating end. A small, but, as we shall show, significant, contribution was made to this debate by Mr. F. D. Marshall, who stated that Mr. Irminger, of Copenhagen, had adopted the equivalent expedient of sucking the gas through the transmission mains, instead of driving it under high pressure.

Mr. Shelton would probably say, justly, that all these other examples differ radically from his application of the same principle, in being cases of very much less exaltation of pressure, and also of difference of use. But we venture to remark that Mr. Shelton's experiment has not been quite accurately described in his paper. What he does is to create a store of compressed gas, in the form of a cylinder 3 inches in diameter and 5 miles long, from which the consumers draw, as and where they please, as much gas as they want. It is, in short, a gasholder. There is nothing in the paper to show that the arrangement could not be tapped equally satisfactorily at either end. In other words, the paper does not offer any data to prove that this Royersford example is a case of increasing the *delivering* capacity of the gas-main by reason of the high pressure. The pressure appears to be as high at the far end as at the beginning, less 2 lbs. or 3 lbs. for friction. Now it is obvious that the delivering capacity of a gas-main depends upon the *difference* of the pressure at the two ends—that is to say, upon the fall. If you start at 20 lbs. pressure and end at 17 lbs., you do not pass any more gas than if you began at 3 lbs. and ended at zero pressure.

If Mr. Shelton drives from one end of his Phœnixville-Royersford main at 20 lbs., and finds at the other that his reducing regulators are not much needed, then he is transmitting gas at the pressure named. He may be doing this; but we have no evidence of the fact. If he is doing it, he should be able to supply some interesting and valuable data as to the extent to which the increase of driving pressure actually increases the delivering capacity of the pipe. Here is a crucial point, which, so far as we know, has never been investigated experimentally. It is, simply, What is the most economical head, or difference of pressure, at which a given length and size of gas-main can be worked, to deliver the greatest quantity of gas for the power expended and the prime cost of the main and plant? The text-books do not help one to solve this problem. Mr. Shelton says, truly, that, other conditions being the same, "quadrupling the pressure doubles the flow." He should have said also that this general rule only applies to small differences of pressure, such as give flows well within the carrying power of the pipe. We are wholly without information as to what happens when the pipe is really doing its best.

Mr. Shelton adopts the optimistic view that the delivering capacity of a gas-main can be increased ten or twelve times by quadrupling the pressure, or head, all through. This contention has not been experimentally verified; and there are many countervailing influences to be taken into the account. The chief of these is friction. It is well to read Dr. Pole's classical essay "On the Motion of Fluids in Pipes," originally published in the "Journal" in 1852, and reproduced in "King's Treatise" (Vol. II., chap. iv.), to arrive at a complete understanding of the physics of the matter. It should hardly be necessary to remind engineers of Mr. F. S. Cripps's useful graphic solution of the usual problems of gas transmission; but we mention this work here because Mr. Cripps is careful to explain that the pressures given by his diagram are "the *difference* between the pressure at the inlet and outlet ends of the pipe." This is, of course, the motive power of the discharge; and it is independent of the internal pressure at which the fluid may be contained in the pipe.

Dr. Pole states that the effect of friction in a pipe is independent of the hydrostatic pressure to which the fluid is subjected. This is true; and it shows that there is at least no advantage in this respect in putting the contained fluid under high pressure. When we come to consider the case of the moving fluid, we are immediately reminded by Dr. Pole that the skin-friction of a fluid moving along a pipe varies with the velocity. He did not know the exact relation; but he made a "shot" at it, and put the rate of increase of friction as equal to the square of the velocity. This is a very serious matter. The particles of fluid in a pipe move faster at the centre than at the circumference. This effect is due to skin-friction between the fluid and the pipe-surface, and also to the viscosity of the fluid itself. What the proper arithmetical or algebraic expression of the effect may be, has not been determined. Besides, at high velocities of motion a third kind of brake-action comes into play—eddying. Evidently, therefore, there is in the case of gas-mains a maximum economical *velocity* beyond which their delivering capacity cannot be driven. This quantity has no relation with the hydrostatic pressure. It matters nothing whether the main carries gas at a mean hydrostatic pressure of 20 lbs. to the square inch, or of 1 inch of water. There is a point beyond which the discharging rate of the cross-section of the end of the main cannot be economically urged; and it is of supreme importance to determine this point in every case.

Obviously, therefore, the force of Mr. Irminger's proceeding remains unaffected; and it matters nothing, on physical grounds, whether the difference of pressure which induces the flow of gas through the pipe is caused by pressure at one end or sucking at the other. Up to a point, and under certain easily-defined conditions, sucking would be more effective than driving; but usually, other considerations determine the choice in favour of driving.

Let us not, in conclusion, run away with the notion that extremely high pressures in gas-mains—that is, pressures beyond anything that can be directly utilized for lifting gasholders, or actuating intensified gas lighting systems—can effect anything to the advantage of the general undertaking, beyond making greater use of the mains as storage. This, of course, may be a good thing to do; but it is at least desirable that we should clearly understand that it is being done. There may be a preferable alternative. On the other hand, as regards speeding-up the delivery, we lack information as to the ultimate possibilities of "boosting" by exhausters or fans. Pole, Barlow, and Cripps all fail us here—not through their own fault, but simply because the question refers to higher differences of pressure than anything they worked upon. We venture now to bring the practical question to a point, by declaring that the general rule about doubling the flow by quadrupling the pressure (meaning the *head*, of course) fails for coal gas after the head surpasses 18 inches, with large pipes of any reasonable length. Beyond this maximum economical velocity, the increased flow is insignificant as compared with the expenditure of power necessary to produce it. Anyone who will either refute or confirm this hypothesis, shall receive the hospitality of our columns for the purpose. We can offer no fairer terms; and the gage is down for all comers.

The Bucharest correspondent of the "Daily Express" repeats an announcement contained in several journals to the effect that the Standard Oil Company have obtained from the Roumanian Government immense privileges for petroleum mining on all tracts owned by the Government, as also the right of exploration and shaft-sinking wherever traces of oil are found. Besides this, the Company have the right to construct pipe-lines wherever necessary. The price of this concession, which gives the Company almost the entire monopoly of mineral oil "welling" in Roumania, is stated to be only £400,000.

LOCAL ADMINISTRATION AND TAXATION.

In the notice of the water section of the recently issued annual report of the Local Government Board which appeared in the "Journal" for Nov. 6, we remarked that these volumes increase in bulk year by year. This is shown by the fact that whereas what may be called the report proper—that is to say, the portion which is signed by the President (the Right Hon. Henry Chaplin)—last year occupied 185 pages, the one lately published extends to 206 pages; the appendices, of which there are seventeen, occupying 744 pages, as compared with 684 pages before. The various subjects dealt with are arranged in five groups, embracing respectively: The work of county councils under the Local Government Act, 1888; proceedings under the Local Government Act, 1894; the relief of the poor; the public health and local administration; and, lastly, local taxation and valuation. These are all subjects of general interest; but it is with the fourth group that readers of the "Journal" are specially concerned. We purpose, therefore, giving, as concisely as possible, an indication of the work done in connection with matters relating to public health and local government, so far as it is considered worthy of being recorded by the Board.

As no projects, whether sanitary or administrative, can be carried out without funds, it will be well to take note of the extent to which sanitary authorities incurred indebtedness in the period covered by the report, and for what purpose they required the money. We find the Board sanctioned the raising of £10,026,336 last year by urban and rural authorities; the former requiring £443,482 for water supply and £1,461,228 for sewerage and sewage disposal, and the latter £125,104 and £406,238 respectively. Joint boards asked for £74,888 for carrying out works coming under the second head. In addition to these sums, £14,260,981 was authorized by Parliament. Many applications were made to the Board for power to raise money for the execution of works of sewage disposal involving the adoption of one of the bacterial processes. Where they were acceded to, the Board required an undertaking from the local authority that, in the event of the method adopted not turning out satisfactory, some other approved method would be substituted. Under section 243 of the Public Health, 1875, the Board recommended the Public Works Loan Commissioners to make advances amounting to £73,070 to local authorities. Of this sum £45,857 was required by town and urban district councils, and £27,213 by rural councils. Under the Public Works Loans Act, 1898, the Board's recommendation is no longer necessary, in the case of loans under the Public Health Acts, unless the period allowed for repayment exceeds thirty years. Since the constitution of the Board in 1871, they have sanctioned the raising of £102,161,317 by urban and rural authorities for the carrying out of various sanitary improvements, electric lighting works, public baths and wash-houses, &c.

Among the Provisional Orders issued by the Board last year, 79 were under the Public Health Act, 1875, and 3 under the Gas and Water Works Facilities Acts, 1870 and 1873. Additional powers were conferred on local authorities in regard to their gas and water works, including the extension of limits of supply and the purchase of works. The largest amount sanctioned was £500,000 to the Manchester Corporation in respect of their gas undertaking; Rotherham was allowed to raise "such sums as may be necessary;" Ramsgate had £30,000; Wallasey, £12,500; and Southport, £5000. With regard to water-works, Reading had £50,000; Southampton, £25,000; Ramsgate, £20,000; and Bath, £6700. The three Orders issued under the Gas and Water Works Facilities Acts related to Ashburton, Wallingford, and Wokingham. The 82 Provisional Orders above referred to were included in Confirmation Bills, and all but two were confirmed by Parliament.

Under section 62 of the Public Health Act, 1875, any district council may apply to the Board to determine the reasonable cost at which water may be required to be furnished to houses without a proper supply; and the Board are empowered, by section 8 of the Public Health (Water) Act, 1878, to fix a general scale of charges for the whole or any part of the district in question. Eight such scales were fixed last year for the urban councils of Ashby-de-la-Zouch, Leigh-on-Sea, and Walton-le-Dale, and the rural councils of Eastry, Ludlow, Penrith, Stratford-on-Avon, and Wigan. The Board also issued an Order, pursuant to an application made to them under the section first named, determining the reasonable cost of providing a supply of water in the case of a particular house in the urban district of Sunbury-on-Thames. Under section 3 of the Act of 1878, the Board issued Orders determining the reasonable cost at which water might be furnished to certain houses specified; while in virtue of section 11, they invested several district councils with enlarged powers under the Act. The question of the pollution of rivers and streams occupied the attention of the Board during the past year; and ten Orders were issued, under the West Riding of Yorkshire Rivers Act, 1894, sanctioning the taking of proceedings by the West Riding Rivers Board against manufacturers, for the pollution of rivers and streams. In some cases, however, the Rivers Board preferred to put in force the alternative power they possess of proceeding under the Rivers Pollution Prevention Act; and accordingly the Superior Board issued two Orders consenting to that course. But in six cases they decided to withhold their consent to the institution of proceedings.

Apart from the local inquiries conducted by the Engineering Inspectors of the Board with regard to applications made to them under the Local Government Acts of 1888 and 1894 and the Municipal Corporations Act of 1882, others, to the number of 1167, were directed. The majority of them had reference to the raising of money for carrying out works of a permanent character under the provisions of the Public Health, Electric Lighting, and other Acts. There were 68 inquiries in regard to petitions for the issue of Provisional Orders under the Public Health Act, 1875, the Gas and Water Works Facilities Act, 1870, and the Housing of the Working Classes Act, 1890; and eleven related to objections to the construction by local authorities of works of sewerage or water supply beyond the limits of their districts, and to the making of reservoirs to hold more than 100,000 gallons of water. Among the subjects of the other inquiries may be mentioned complaints, under section 299 of the Public Health Act, 1875, of the default of district councils in the performance of their duty in the matter of sewerage and water supply, applications for consent to the taking of proceedings against manufacturers on account of the pollution of rivers, and for fixing a scale of charges at which water may be required to be furnished to houses without a proper supply. In an appendix to the report is given a list of the Acts obtained last year by local authorities and by gas and water companies in England and Wales (exclusive of the Metropolis). The approval of the Board, as far as matters within their jurisdiction were concerned, was duly given, under section 4 of the Borough Funds Act, 1872, to the resolutions of 52 urban councils to promote 59 Bills, and to those of 71 councils to oppose 54 of them. During the year, the Board made reports to Parliament on 146 Private Bills, of which 69 were promoted by local authorities and 77 by companies. In 17 cases it was found necessary to make supplementary reports, in consequence of alterations made in the Bills during their passage through Parliament. The portion of the report bearing upon the Metropolitan Water Supply has already been dealt with.

The District Auditors of the Board had before them the accounts of 803 urban district councils, 663 rural district councils, 43 port sanitary authorities, 66 joint boards for sanitary purposes, 20 isolation hospital committees, and 234 joint committees appointed wholly or in part by district councils. They made a considerable number of disallowances and surcharges; 624 being in the accounts of urban district councils and their officers and 14 in those of gas, water, and sewerage boards. Among the appeals made to the Board against disallowances, &c., they decided 335. Particulars of the appeals, and of the Board's decisions thereon, are tabulated in one of the appendices. The next portion of the report is devoted to a review of the labours of the Chief Inspector under the Alkali, &c., Works Regulation Acts (Mr. R. Forbes Carpenter) and his assistants, which were fully dealt with in our columns when the separate Blue-book in which they are recorded was published.

The remaining subject to be noticed is that of local taxation and valuation. The Board prepared and presented to Parliament in the past twelve months returns showing, for the financial year 1897-8, the receipts, expenditure, and outstanding loans of the various local authorities in England and Wales. They include summaries of the accounts of no less than 30,132 of these bodies. A summary of the statistics is given in one of the appendices. It shows that the aggregate receipts amounted to £69,144,543, which included £5,091,467 from gas-works, £3,292,098 from water-works, and £427,310 from electric lighting. The expenditure, so far as it was not defrayed out of loans, came to £67,823,716, including £3,956,793 for gas-works, £1,284,478 for water-works, £1,283,254 for public lighting, £218,200 for electric lighting (other than for public purposes), and £1,562,667 for sewerage and sewage disposal. Included in the total expenditure is a sum of £14,218,949, "principal of loans repaid and interest on loans." It is explained that this sum cannot be apportioned exactly between the various works and purposes for which loans were raised; but £970,000 is put down for gas-works, £2,230,000 for water-works, and £190,000 for electric lighting. The outstanding loans of the local authorities in England and Wales at the end of the year amounted to £262,017,152, of which £18,292,119 was for gas-works, £47,867,413 for water-works, £3,674,641 for electric lighting, and £27,190,006 for sewerage and sewage disposal works. The relative proportions which the above grand total bore to the National Debt at the end of the financial years 1874-5 and 1897-8 respectively are strikingly shown by the following figures: 1874-5.—Debt, £768,945,757; outstanding loans, £92,820,100, or 12·07 per cent. 1897-8.—Debt, £634,435,704; outstanding loans, £262,017,152, or 41·30 per cent. According to these figures, the decrease of upwards of £134,000,000 which took place in the period named in the amount of the National Debt was accompanied by an increase of more than £169,000,000 in the total outstanding loans. Compared with the population of 1891—29,002,525—the loans were equal to £9 0s. 8d. per head; and taking the rateable value at Lady-day, 1897, as £168,664,993, they were equivalent to £1 11s. 1d. in the pound. An interesting table shows how the amounts received from the public rates by the several classes of local authorities have risen since 1873. In that year the total was £18,906,137; in 1897-8, it was £38,882,162—an increase of no less than £19,976,025. It is explained that much of this is attributable to "the needs of an increased population," and it has to a certain extent been accompanied by a rise in rateable value—the figures given being 32·7 and 50·1 per cent. respectively. Moreover, some was due to legislation which took effect immediately before or during the period specified. The increase in the amount of rates raised to meet the expenditure of School

Boards (established under the Elementary Education Act, 1870) is cited by the Board as worthy of special notice—the amount raised in 1873-4 being £251,906, and in 1897-8, £4,909,696. This is a great increase; and some ratepayers may be inclined to ask whether, after all this outlay, the product has not been a set of sciolists and Hooligans.

MR. L. F. VERNON-HARCOURT ON THE PROFESSION OF CIVIL ENGINEERING.

THE November issue of the "National Review" contained an interesting article by Mr. L. F. Vernon-Harcourt on "Civil Engineering as a Profession," tracing its modern history from the days of Smeaton (of Eddystone Lighthouse fame) down to the present time, and also outlining the steps in the career of a civil engineer of to-day from his pupilage to the top of the professional tree. It is to the latter part of the article that we should especially draw attention. In the historical introductory pages, Mr. Harcourt points to the ever-widening field of activity open to the engineer (clearly foreseen in 1828 by the founders of the Institution of Civil Engineers, who, when applying for its charter, remarked that the scope and utility of the profession was "limited only by the progress of science, and would be increased with every discovery in philosophy, and its resources with every invention in mechanical or chemical art"); to the increasing demand for special knowledge in each sub-division of the profession; and to the inevitable consequences—namely, the ever-growing tendency towards specialization on the part of the individual, and the greater need of careful scientific training for those desirous of making their mark in the engineering world.

In the first half of the century, when the consequences of the discovery of the power of steam were beginning to make themselves felt in the development of our railway systems, and the demand for engineers exceeded the supply, "a mechanical turn, however slight, and a preference for an outdoor life were considered ample evidence by parents that their sons were fitted to become civil engineers;" and for a long time practical training was all that the student received. Nowadays, however, the need of a preliminary training in theory and science is required, and rightly required, of most engineering pupils. We say of "most" engineering pupils advisedly, because there is reason to fear that the need of some preliminary qualification and proof of fittedness for his profession being required of every would-be engineering pupil, is not recognized as fully as it should be in every quarter of the gas world. The sons of officials in some companies are accepted as pupils by the works managers without any, or with little, regard to their ability or to their antecedent education. In the course of time, they are given positions of responsibility in the concern, after by no means too careful an examination into the results of their under-studying of a man who was perhaps chosen in the same way—namely, on account of his seniority. By the aid of a constant shoring-up by competent foremen, such "engineers" may, and do, run works without disaster. If the sole qualification necessary to entitle a gas engineer to claim credit for his lifework were the fact that he had never come to obvious grief, the system of selection outlined might be defensible; but if it be desirable that gas-works should be in the hands of men of scientific training, proved ability, enterprise, and initiative, men capable of taking a broad view of the problems of management as well as of manufacture; if the ideal of gas engineering be the most economical production of marketable gas—then the sooner some managements reconsider their methods of admitting pupils and selecting engineers, the better.

The subjects enumerated by Mr. Harcourt as of most importance to student engineers are "mathematics (especially trigonometry), statics, dynamics and hydrostatics, elementary physics, hydraulics, the principles and practice of surveying, mechanical drawing, and graphic statics. Some knowledge of geology, chemistry (particularly in gas engineers), and meteorology is desirable; while acquaintance with two or three of the principal foreign languages—such as French, German, and Italian—is very serviceable for reading foreign engineering publications, visiting public works abroad, and discussing engineering problems with foreign engineers." A pretty long list; but through how many can the man who wishes to be a "thorough-bred" gas engineer safely put his pen?

Before leaving the subject of pupil engineers we may notice one other point, and that is the need that students on a works should be allowed to learn every branch of the duties of the engineer, and not be kept merely to that section in which they are found to be most useful. It is not a very acceptable principle to the engineer-in-chief, and is only too rarely acted upon, that the pupil is best employed on work of which he is most ignorant. But how else is he to become generally efficient? To take a premium for teaching a pupil, and then to only use him as an assistant on the work he knows best, is something very close to obtaining money under false pretences.

Having passed from a pupil to an assistant engineer, and having acquired some experience and reputation in that sphere, it becomes necessary for a young man to decide as to the best course for him to pursue—to endeavour to become a works manager or engineer to some undertaking, or to set up in practice on his own account. The latter is, in the absence of local influence or of an inherited practice, a very hazardous experiment for any but the most reputed engineers. Mr. Harcourt points out that one of the surest ways to attain the position of consulting engineer is to be the son of one; and he protests "in the interests of the public, and of the reputation and progress of the profession," against the too-common custom of a father who has achieved eminence in the engineering world by his own merits, taking his sons or chief assistants into partnership, and thereby enabling them to trade upon his name while frequently not possessing his qualifications.

Another feature of modern times not tending to the advancement of civil engineering in the estimation of the public, is the tendency for engineers of high reputation to accept more work than they can possibly superintend efficiently, with the result that much of it is delegated to subordinates. "Schemes, reports, and designs are prepared, and works are carried out, in a kind of routine manner, by numerous assistants, with little of the guiding hand of the engineer (except in very important cases), though the work has been obtained in consequence of his personal repute. Much, in such cases, depends on the capacities of the assistants, though the responsibility and credit rest with the engineer; and the work would often be more satisfactorily done by a specially competent rising engineer, who could attend personally to the matter, and give it more thorough consideration." This is a difficulty that is encountered in other professions as well. The name of a firm of well-known accountants at the foot of a balance-sheet often means nothing but that a clerk employed by the firm has more or less efficiently audited the accounts; but the public do not understand this. And how often does the leading Q.C. take his retaining fee, while the Junior Counsel is the only one to be seen in Court?

"Civil engineering," adds Mr. Harcourt, "being a scientific profession, should not be suffered to degenerate into a business." We confess we do not quite appreciate the point in this remark. It is certainly not so satisfactory for the public that work especially given to and undertaken by a certain engineer should be executed by another employed by the first; but why the second engineer should be said to be doing something which "does not require very special qualifications for its successful prosecution"—Mr. Harcourt's definition of a business—when if the same work were carried out by his superior it would be a professional service ("requiring very special qualifications," &c.), is somewhat difficult to understand.

As to what qualities are most valuable in an engineer, Mr. Harcourt specifies "a very retentive memory; a power of rapidly assimilating the main features of a problem, and of separating the essential from the unimportant facts; a capacity for observing carefully the chief parts of a site inspected, and carrying away a sort of photographic picture of them in his mind which can be called up when required; and the capability of weighing opinions and evidence, of noting the scientific bearings of the question, of investigating any possible objections, and of arriving at a sound decision." He should be able, also, to write a clear and forcible report, or technical essay or book; should be able to take part in discussions on professional topics; and be capable of thinking rapidly and expressing himself clearly in the witness-box or before a Parliamentary Committee. One is tempted to remark, "*machinator nascitur, non fit;*" and so, indeed, is it true of the very first rank in the engineering—as in every other—profession. You cannot manufacture Stephensons, Brunels, or Liveseys, any more than you can Huxleys, or Gladstones, or Shakespeares. But that is, of course, no reason why we should not try to get as much inspiration and guidance from them as possible.

In regard to the giving of expert evidence, we would thoroughly endorse what Mr. Harcourt has to say. After remarking that a consulting engineer naturally accepts most of the work offered him, and thereby gains varied experience, he adds: "The giving of expert evidence, however, should form an exception to the general rule of accepting work; for though an engineer is obliged to support his own schemes before Parliamentary Committees . . . he should regard it as derogatory to his profession, and to his standing as a man of science, to become a sort of advocate in place of an impartial witness, by consenting to give evidence in support of, or in opposition to, schemes, without being thoroughly convinced of the soundness of the views which, from an engineering standpoint, he is asked to endorse."

Every budding engineer, and the "full blossoms" too, should read Mr. Harcourt's very able article upon the profession which, as he says, in dealing with the practical applications of science, has fresh problems to consider at every turn, and is ever full of interest and possibility.

Cheaper Coal.—The optimistic views recently expressed by Mr. George Livesey on the question of an early drop in the price of coal have been strikingly justified by recent events. We learn that the South Metropolitan Gas Company have just bought 800 tons to make up a cargo of coal f.o.b. the Tyne at 11s. 3d. per ton. The Company's contract with the colliery concerned is at 15s. 6d. a ton; but as the latter were in advance with their deliveries, and wanted an extra boat to keep their pit going, they accepted 11s. 3d. An announcement made in last Friday's papers has an important bearing upon this question. It was reported that, owing to severe depression in the coal trade of the Forest of Dean, the house-coal owners had resolved to reduce the quotation 2s. per ton as from the 1st inst.

THE CONVICTION OF THE AUDITORS OF DUMBELL'S BANK.

THE evidence given at the recent trial of a Director, a Manager, and the three Auditors of Dumbell's Banking Company, has brought forcibly before the public once more the question of the value of an audit. Moreover, and most fortunately, the result of the trial must call the attention of the profession of accountant auditors very urgently to the subject of what are the duties of an auditor, how those duties are usually fulfilled, and what may be the consequences to an auditor of a default in the performance of his duty. The prisoners were charged (and convicted) with making, circulating, and publishing, and concurring in making, circulating, and publishing, balance-sheets which they knew to be false in material particulars, with intent to deceive and defraud the members, shareholders, and creditors of the Bank. Rogers, the local (Isle of Man) Auditor, was sentenced to eighteen months' imprisonment; and the two Manchester Auditors, William and Harold Aldred, to twelve and six months' imprisonment respectively—all the sentences being "with hard labour." Such sentences upon auditors, against the last two named of whom no charge of benefiting by their default of duty was brought, may well be described as exemplary, and must undoubtedly prove a rude shock to the tranquil self-satisfaction with which the majority of auditors appear to regard the manner in which they "fulfil" the obligations of their office.

It is always a sad thing to witness the sentencing to hard labour of an old man 76 years of age (as is the senior Aldred), who, during a long business career, has enjoyed a reputation for uprightness, and the confidence of his fellow-citizens. Apart from this natural sentiment (which can, or ought, never to influence the course of justice), we feel nothing but satisfaction at the result of this trial; and the heads of the profession, its institutions, and its journals, will best serve its interests and reputation if, instead of moaning over the fancied injustice of the sentence, they can bring themselves to realize that their attitude of defence of the conventional and futile methods still adopted by not a few of its members is in no small degree answerable for the ruin that has overwhelmed Aldred and his son. We have time and again urged the profession to take a long-sighted view of the necessities of the case, and to do all in their power to restore the confidence of the public in auditors' certificates by taking every opportunity of reprobating and excommunicating those of their members who may be proved to have fallen short of the highest standards of auditing principles. If this had only been done—in conspicuous instances it has not been done—is it likely that the Aldreds would have put to the balance-sheets of Dumbell's Bank those signatures which have been the cause of their downfall?

The case is so important—not only as far as it concerns auditors, but also as regards directors and their duties—that attention must be called to one or two points of principal interest in the evidence. In the first place, the reputation of the Manchester Auditors is to be noted. It has been said before now that "first-class" firms of auditors do not pursue futile methods of examination. We have asked for, but failed to obtain, a definition of the means by which the public may know which are the "first-class" among the auditors belonging to the Institutes of the profession. Well, in this case, the senior Aldred was able to call two ex-Mayors of Manchester, the Chairman of the Salford Quarter Sessions, and other prominent citizens, to prove that he bore a very high character, was greatly esteemed and trusted, and was of "unequalled" reputation for honesty and integrity. It was, moreover, stated that he was Auditor of the accounts of the Manchester Corporation, and of several business concerns with which Sir Bosdin Leach (a past Mayor) is connected. Would not the public be justified in assuming his firm to be among the "first class"?

Yet how did this firm conduct the audit of Dumbell's Bank? We will endeavour briefly to indicate. The Articles of the Company provided that no advance should be made to any director or officer of the Bank without the consent in writing of the Board of Directors; and, also, that the explicit duty of the Auditors was to distinguish in their reports between good, bad, and doubtful debts. Nevertheless, at the time the Bank collapsed, one of the Directors named Nelson (whose assets were valued at £10,000) had overdrawn his account to the extent of no less than £71,985, unknown to the Board, and without the knowledge of the Auditors, until they "accidentally" discovered the fact during the last year of the Bank's existence! The overdraft was not previously noticed by the Auditors, because it was made at a branch office, and "the branch accounts were not examined by the Auditors; the practice being for the branch managers to send to the head office certified returns and abstracts of balances." When, moreover, the advances to Nelson were thus accidentally discovered, the Auditors, instead of immediately calling the attention of the Board thereto, were content with an official's assurance that Nelson was a very rich man—it not, apparently, occurring to them that it was a curious thing that "a very rich man" should need to overdraw his account by tens of thousands, year in, year out. The culpable futility of such "auditing" hardly needs other demonstration; but it will be useful to further examine the evidence.

As already remarked, the duty was explicitly laid upon the Auditors to distinguish in their reports between good, doubtful, and bad debts. But the Liquidator, on investigating the accounts of the Bank, found that, in June, 1899, about £470,000 of debts which were included as good were doubtful; and that, of these, debts to the amount of £200,000 were absolutely irrecoverable—one, for instance, being due from a customer who died insolvent in 1882. Moreover, interest was being still charged upon these outstanding worthless balances; the annual total of the charges being equal to the dividends paid! It may be added that the paid-up capital of the Bank was only £50,000.

This does not, however, reach the limits of the failures in duty, and in sense of duty, of these Auditors. Neglect to properly examine accounts when, as a matter of fact, one has every confidence in their genuineness and accuracy, is bad enough, and cannot be too frequently declared to be dishonest as well as dangerous; but what condemnation is too strong for men who, having serious doubts as to the legitimacy of most material items in accounts, yet neglect to thoroughly investigate every detail of those items, and actually sign the accounts year after year? This, however, is what the Aldreds did. It was shown that, so far back as 1885, they called the attention, not of the Board nor of the shareholders, but of the officials, to certain accounts which they considered irregular; while in July, 1899, they wrote to one of the officials of the Bank (now sentenced to penal servitude) to say that "each half year we sign the account with more hesitation, owing to what we consider the excessive overdrafts." This letter also proved that at their previous attendance the Auditors had expressed their uneasiness in respect of the large overdrafts. Yet they signed the balance-sheets for December, 1898, and June, 1899, without reserve. In December last, they wrote: "It becomes increasingly difficult for us to sign accounts including so many increasing balances in respect of which we believe your security to be altogether inadequate." The senior Aldred stated in evidence that he "was always assured at the end of every audit that the contingent fund would provide for every doubtful debt." These Auditors, therefore, stood convicted out of their own mouths of having signed an unqualified certificate to accounts which they believed to be misleading, upon the assurance of the officials whose honesty they were appointed to check. No word did they write to the Directors as to their doubts; no reservation did they make in their certificate. Aldred said "he believed that the letters they wrote as Auditors to the Manager were laid before the Board of Directors"—this belief being founded upon the Manager's statement. "He never thought the Bank was insolvent." Is it not really difficult to read such words with patience? "They thought;" "they believed;" "they were assured;" but never did they examine, investigate, determine—the very vital essence of an auditor's duty.

The organ of the profession, "The Accountant," in discussing the evidence, suggests, as a point in favour of the Aldreds which was not sufficiently emphasized by the defence, that "it takes some time for suspicion to fructify into action sufficient to pull up a Bank." Now on this there are one or two observations to make. The bad debts of Dumbell's Bank had been growing for practically the whole period of its existence. The extreme case mentioned by the Liquidator was that quoted above, of a balance due from a man who died in 1882 insolvent. For a period, therefore, of over fifteen years, there were on the books of the Bank items among the assets which a thorough investigation would have shown to have been absolutely indefensible. Had the Auditors done their duty, the Bank would have been pulled up at the beginning of the period, not at the end, when all harm was done. A debt due from the insolvent estate of a deceased customer could by no manner of reasoning be considered a good debt. It is no case of sufficient or insufficient security, but one of absolute worthlessness; and the item would be immediately disallowed by any competent auditor, and a strong representation made personally to the directors, while any continuance of the system of allowing bad or doubtful debts to remain among the assets should have been met at once by a statement of the fact to the shareholders, in accordance with the explicit terms of the Articles. The plea that suspicions in regard to the genuineness of assets which grew steadily and rapidly in amount—suspicions which would have been more than confirmed by an audit such as should have been, but was not, made—require any considerable time, leave alone fifteen years, to ripen into action, is simply inadmissible.* An auditor who can write that "each half year he signs the account with more hesitation," writes his own condemnation; and the letters quoted constitute, in our opinion, full justification of the sentences meted out to the authors.

Counsel for the Aldreds pleaded, in mitigation of their offence, that "his clients, whatever they had done or not done, had been actuated throughout by good faith, and had acted in ignorance of the actual facts, as now known," and begged "a fool's pardon" for them. Now if at the trial of an engine-driver, who had seen but had taken no notice of a warning signal, and had remarked to the stoker that he passed each signal set at "danger" with more hesitation, and had occasioned, by his failure of duty, a serious accident to his train, Counsel for the defence pleaded that, whatever the engine-driver had done or not done, he had been actuated by good faith and had acted in ignorance of the actual fact that there was another train in front of his, and finally begged "a fool's pardon" for him, what would the Judge be likely to say? And it must not be forgotten that few railway accidents could be

* We are glad to see that, in a second article dealing with the trial, the "Accountant" fully endorses the verdict of the jury, and expresses doubt as to whether "anything short of a plea of insanity could have been seriously entertained as any excuse."

attended by more widespread suffering that has been occasioned in the Isle of Man by the failure of Dumbell's Banking Company. If the trial and conviction of the Auditors of that concern should lead to every auditor writing large upon his walls: "Beware of Negligence," some good may arise out of evil.

Finally, attention may well be called to the evidence given by the Chairman and largest shareholder of the Bank. It was not lengthy, but sufficient. He said that, "although he frequently asked questions as to overdrafts, he had never asked for the books of the Bank, *as they would have been unintelligible to him*." Commenting on this, "The Times" calls it "perhaps the most extraordinary bit of evidence in the whole trial," and adds: "Conceive a man acting as chairman of a board of directors, and yet confessing that he could not understand so simple a thing as a bank account!" We can conceive—we have indeed heard—of directors possessing such a minimum amount of business capacity, and such a thorough ignorance of the affairs of the concern they are supposed to "direct." True 'tis a pity, but pity is 'tis true. We commend a careful consideration of the evidence in this sensational trial to all directors as well as to all auditors.

PROFESSOR LUNGE ON COAL TAR AND AMMONIA.*

[Second Article.]

The present edition of Professor Lunge's work contains 248 pages, with 84 illustrations, dealing with ammonia, against 194 pages, with 53 illustrations, in the 1887 edition. This substantial increase in bulk is fairly uniformly distributed over the various chapters, which now number four, as compared with three in the earlier edition, owing to two chapters being now devoted to the working up of liquor, in place of one.

The sources from which ammonia is obtained are discussed at greater length than formerly; and there is a slight re-arrangement of the sections of the chapter which deals with them. From a practical point of view, it would have been better to speak of many of the sources referred to as potential rather than as actual sources. They are classed under ten groups, of which several are practically unimportant. The first refers to the natural occurrence of ammonia—*e.g.*, in the air in minute traces, in guano deposits as bicarbonate, in the Tuscan *suffioni* and lagoons, in the neighbourhood of volcanoes, and in a few minerals. Considerable quantities of sulphate of ammonia are said to come from Tuscany as a bye-product in the manufacture of boric acid. The second group comprises ammonia formed from atmospheric nitrogen. The pages of Professor Lunge's work which refer thereto read like a catalogue of inventions which have failed; for the conversion of atmospheric nitrogen into ammonia has always proved a most fascinating exercise for inventors, although few schemes have even passed beyond the laboratory stage. Nor, so long as we have a store of nitrogenous bodies, derived from the atmospheres of bygone ages, in our deposits of coal and peat, does it seem likely that a process for artificially producing ammonia from atmospheric nitrogen will prove a commercial success.

The third group covers the ammonia formed in inorganic chemical manufactures; and Professor Lunge concludes that none of the processes classed in it are likely to be remunerative under present circumstances. Then he deals with ammonia from animal excreta, &c., which form a perfectly practicable source in cases where they can be collected without dilution. It seems that in Paris, Amsterdam, and some other Continental towns schemes for collecting and treating excreta for the production of ammonia, have been adopted; but apparently the amount of ammonia recovered from such sources is not known precisely. The fifth source is guano. This, apart from any ammonium bicarbonate present which was included in the first group, may be treated for the production of ammonia salts, which, however, would have a lower manurial value than the guano itself. Hence this source is practically useless. The next group comprises ammonia from bones, horn, and other animal substances, which are generally used for the manufacture, primarily, of bone charcoal or prussiate, and ammonia is recovered only in some cases as a bye-product. Professor Lunge does not estimate the amount obtained from this source. The next group relates only to ammonia as a bye-product in beetroot sugar factories. The amount so obtained appears at present to be small. Professor Lunge computes that if all the beetroot sugar works in Germany recovered the total ammonia given off, it would yield 15,000 tons of sulphate. Most of it is now lost. During the last few years, however, the endeavour has been rather to produce cyanides from the molasse liquors in place of ammonia.

The last three groups really cover the sources from which the bulk of ammonia products are obtained, or are likely to be obtained in the immediate future. The first of these three comprises peat; but it does not appear that much ammonia is at present obtained from this source. The second comprises shales; and the amount of sulphate actually obtained from the Scotch shale distilleries has been from 37,000 to 38,000 tons for each year from 1895 to 1899. From this, the second largest source of ammonia products, Professor Lunge passes on to the last group, which includes ammonia obtained from coal, (1) in the manufacture of gas, (2) by treatment with steam, (3) from coke-ovens, (4) from blast-furnaces, (5) from producer gas, or (6) from ordinary coal smoke. Gas manufacture, of course, continues to be the chief source of ammonia products in this country. We confess that we are somewhat at a loss to understand what grounds Professor Lunge has for writing as follows:—

> Since the great bulk of the ammonia compounds is obtained as a bye-product in the manufacture of gas, and the latter is unlikely to be more extensively employed than it is at present, the question must necessarily arise—what will be the state of things if the demand for ammonia should exceed the supply?

Why does he believe that the use of gas will not continue to extend? He does not tell us; and it is certain that everything points to a steady and by no means insignificant increase in the employment of gas. Surely Professor Lunge had not studied the statistics of the gas industry for the last few years when he wrote thus of its future.

A good many new data on the distribution of the nitrogen of coal on carbonization have been introduced since the last edition; but most of them will be familiar to readers of the "Journal." Professor Lunge does not appear to have taken the trouble to ascertain the extent to which Cooper's coal-liming process is now used; for he says, as he said in the 1887 edition—

> Only a few gas-works introduced Cooper's process; and, according to information received by the author from highly trustworthy sources in 1886, there was but little prospect of its more general adoption, as the extra yield of ammonia is counterbalanced by several drawbacks.

We believe he could have satisfied himself without much difficulty that the drawbacks have led to the process being discarded at nearly all the works at which it was tried. In fact, so far as we are aware, it is now used in this country only at Folkestone. We are sorry to see that spent oxide is still regarded as a practicable source of ammonia, as it is evident that it cannot be so if efficient scrubbing of the gas is practised.

Coke-ovens constitute an important source of ammonia, especially in Germany, where 42 per cent. of the coke produced is obtained from ovens provided with ammonia-recovery plant. The yield of sulphate from the German coke-ovens is now estimated at 84,000 tons per annum. In Great Britain, however, though it is estimated that 35 million tons of coal are carbonized in coke-ovens, ammonia is recovered from only 1,100,000 tons; and the yield of sulphate is therefore only about 11,000 tons. Perhaps it is well for the gas industry that it is so; but there can be no doubt that the more economical German practices in the coking of coal are now being adopted here to an increasing extent. Fortunately, however, the demand for sulphate for manurial purposes is likely, according to Professor Lunge, to increase at as great a rate as its production. Much more of such nitrogenous fertilizers can be applied as the conditions of rational agriculture are better understood. The prospect does not therefore seem disheartening to gas managers, even though the gas-works production of sulphate be eventually surpassed in this country—as it has been in Germany—by that of the coke-ovens and blast-furnaces. The recovery of ammonia from ordinary coal smoke is, of course, at present out of the question, though Professor Lunge gives, for what it is worth, a statement by Professor W. Foster that he found 11·55 per cent. of ammonium sulphate in the soot from a coal-fire!

The chapter on the "Composition and Analysis of Ammoniacal Liquor" has been adequately revised for the present edition; but naturally it did not require the extensive changes which were needed in other parts of the book.

In the next chapter, on "The Working-Up of Ammoniacal Liquor," a great deal of new matter has been introduced on the manufacture of "concentrated gas liquor," of pure liquor ammoniæ, and of anhydrous liquid ammonia. Concentrated gas liquor is largely produced at German gas-works, and contains 15 to 20 per cent. total ammonia. It is consumed in large quantities in the manufacture of ammonia-soda. With regard to pure liquor ammoniæ, Professor Lunge says that its manufacture is "the most difficult, but the most remunerative, way of dealing with gas liquor, and is practised on a very large scale; the demand for this article for cold-producing machines being very great." The processes and apparatus for the manufacture of both concentrated gas liquor and liquor ammoniæ are fully described; and gas managers who have to work up liquor might profitably consult this portion of Professor Lunge's work before they decide to continue to make sulphate only. But it is doubtful if it is fair to expect any gas manager to master more than one process of dealing with gas liquor, and especially such an operation as that of the manufacture of pure liquor ammoniæ. Such processes always require close supervision of a manager killed in them; and the gas engineer will find, as a rule, mores profitable employment in his more legitimate avocations. If he is asked to undertake the manufacture of liquor ammoniæ in place of sulphate, we would recommend him to secure a skilled subordinate, to whom he could depute the task of supervising the working of the new process. With regard to the manufacture of sulphate, the information contained in the second edition is now somewhat amplified. We are inclined to think that Professor Lunge credits, to a far greater extent than is actually the case, English sulphate works with continuing to use apparatus which has become obsolete. His observations on the avoidance of

* "Coal Tar and Ammonia." Third and Enlarged Edition. By George Lunge, Ph.D., Professor of Technical Chemistry in the Federal Polytechnicum, Zurich. London: Gurney and Jackson; 1900.

nuisance from sulphate works are well worth reading by anyone in charge of such works, notwithstanding the beneficent supervision exercised in this country by the Alkali Inspectors.

The last chapter in the book is a short one on "Other Technically Important Ammonium Salts." It also deals with the estimation of ammonia. There is nothing here that calls for special comment. Then follow an appendix, giving some useful tables, and the inevitable *addenda*, which are fewer in this than in the second edition. The index brings up the present volume to 929 pages.

The work, of course, is a *sine quâ non* to all engaged in tar distilling or in the working up of gas liquor; and every gas manager will find it a useful reference volume. We are disposed to think, however, that the great bulk (and high price) of the present edition indicates that it would have been better to have issued it in two parts—one on Coal Tar and one on Ammonia—so that those interested in one of the products only need not necessarily have been burdened with a lengthy treatise on the other.

NICHOLS ON THE ACETYLENE FLAME.

An instructive memorandum on "The Acetylene Flame" has been written by Mr. Edward L. Nichols, and appears in the last issue of the "Journal of the Franklin Institute." The author has experimented for a considerable time with the acetylene flame, with the object of determining its usefulness in the physical laboratory. He has not completed his experiments, because the subject is a surprisingly broad one, and new questions are continually presenting themselves in the course of the investigation. Although he disclaims the industrial point of view in regard to these observations, it is impossible to dissociate industrial considerations altogether from the statements he makes respecting the results of his experiments. Speaking in the first place as a physicist, Mr. Nichols remarks that the peculiar attraction of the acetylene flame for workers in physical science lies in the fact of the fuel being of definite chemical composition, which burns under suitable conditions with a flame of great brightness, stability, and actinic power. Thus it appears calculated to lend itself readily to the attainment of greater precision in photometric and spectroscopic research, and other desirable purposes. Such is the reasonable expectation of those who become acquainted with this new addition to the resources of the physical laboratory; but experience of the acetylene flame soon shows that its complete control is no simple matter.

The first important discovery in this connection is that the illuminating power of acetylene depends to a surprising degree upon its age, and also upon the method by which it has been produced. The gas loses much of its illuminating power when stored for a long time over water; and Mr. Nichols is not sure but the same is true of any and every store of acetylene, however preserved. He cites an example of a sample of acetylene put into a water-sealed gasholder in the spring of 1899, and left untouched for five months, when its flame was compared with that of some newly-made gas. The old gas had an illuminating power of only 6 per cent. of the new, although the colour of its flame, examined by means of the spectro-photometer, showed a scarcely appreciable change. A preliminary chemical analysis showed that the stored gas was 25 per cent. acetylene. It is obvious, from this example, that acetylene must be consumed while it is new, to avoid loss by the breaking down of the compound; but precisely how long the gas will keep in its pristine state and value, Mr. Nichols cannot yet say. He is still investigating the point.

The illuminating value of the acetylene also depends largely upon the character of the process by which it is generated. There are two distinct methods of treating carbide of calcium for generating acetylene—the so-called dry and the wet. In the former, water in small quantities is added to large quantities of the carbide; in the latter, small quantities of the material are thrown into large quantities of water. Mr. Nichols tried gas made in both ways, one after another, and found that the illuminating power of the dry-process gas averaged about 80 per cent. of that of the other sample. Examined by the spectro-photometer, the colour of the dry-process light appeared inferior to that of the wet-process acetylene light. Experiments were also made with mixtures of acetylene and hydrogen. It is admittedly one of the disadvantages of acetylene that, unless mixed with air, or with some other gas less rich in carbon, it burns with a smoky flame. The former expedient is followed in the design of burners for ordinary purposes; but the addition of air in unknown proportions upsets all the certainty attaching to the use of a standard fuel, under standard conditions. Mixing common coal gas with acetylene enables the air-hole burner to be dispensed with; but there is little to be said in favour of it. The use of hydrogen as a diluent has been suggested; and Dr. C. H. Sharp has carried on some investigations on these lines under the auspices of the American Institute of Electrical Engineers, with the object of obtaining an improved standard of light. He burnt acetylene and hydrogen, half-and-half, in oxygen. Hartman has tried various proportions of the same mixture, burnt in air. The colour of the mixed flame is whiter than that of pure acetylene. These mixtures burn cleanly, with the same lava burner-tip, up to 60 per cent. of acetylene. The practice of using a given mixture of acetylene and hydrogen for photometric purposes would have much to recommend it, but for the fact that acetylene is so rapidly absorbed by water that it is impossible to be sure at any moment as to the percentage composition of the mixture in use. And although the colour of the flame would not be seriously affected by small changes in the proportions of the two gases, the illuminating power would vary widely from the same cause.

These preliminary investigations do not offer a very encouraging prospect to those who think of acetylene as a possible source of an improved photometric standard. Yet the flame possesses certain characteristics which, Mr. Nichols says, merit further consideration. It is, for one thing, of remarkable stability. He has observed the union-jet acetylene flame by projecting its image on the screen; and in this way he has made several discoveries as to the peculiarities of this kind of flame. Thus at low pressures, up to 2 centimetres, the two jets of gas issuing from the orifices in the lava tip of the burner are seen to impinge upon and deflect one another, without producing actual commingling of the columns of heated gas. The gas-flame is, in fact, two flames rising side by side, with a dark dividing line between them. At higher pressures, there is complete union of the jets of gas at the point of contact. The united flame thus formed is found to consist of a layer of heated gas surrounded by a sheath or mantle of highly luminous material, which, at some risk of confusing the ideas of his readers, Mr. Nichols also calls a "mantle." The thickness of the entire flame, measured from outside the luminous sheath on each side, is 6·5 mm. The thickness of the actually luminous sheath itself is only 0·5 mm. (An illustration of the difficulty of reading "American" is supplied by the circumstance that, within a few lines, this writer uses the terms "sheath," "mantle," and "layer" to designate one and the same thing.)

Respecting the great stability of the acetylene flame—a quality naturally most attractive to any photometrist who has worked with the Hefner or the 1-candle pentane standard—Mr. Nichols mentions, as a proof of its existence, the certainty with which different regions of the flame can be explored with a thermo-couple. From the luminous sheath of the ordinary acetylene union-jet flame outward, there is a very steep gradient of temperature, falling within a distance of 4 or 5 mm. from something higher than the melting-point of platinum to 1000° C. lower. If the loop of a thermo-couple is flattened out for a short distance, so as to make it into the form of a truncated V, the shape is a convenient one for introducing into and measuring the temperature of any vertical plane lying within or near the flame. By fixing it into a horizontal holder capable of being moved by a micrometer screw, the flattened part of the couple can be adjusted to lie in any part of the flame; and so steady is the latter, that the temperature once indicated will scarcely vary with the most sensitive measurements.

Another desirable characteristic of the acetylene flame, from the photometrist's point of view, is its great intrinsic brightness. Mr. Nichols determined this by measuring the photographed areas of one side of an acetylene and a coal-gas flame of equal illuminating power. These areas were approximately as 1 to 12. This means either that the density of the one flame must be, in luminous particles, twelve times that of the other, or that its temperature must be higher, or that both causes are acting in combination to produce the greater radiant effect. The last is the probable reason in this case, although the higher incandescence of the carbon in the acetylene flame as compared with the carbon of coal gas is the major influence.

As regards its colour, the acetylene flame is somewhat whiter than the ordinary lime-light—lying between it and the electric arc. Acetylene burnt in oxygen is distinctly whiter than the ordinary flame in air; being almost exactly of the same tint as the light of commercial electric arc lamps. In temperature, the acetylene flame is stated by Nichols to attain the maximum of 1900° C., as compared with maxima of 1780° C. for a luminous coal-gas flame, and 1675° C. for a candle-flame. These measurements are corrected for the abstraction of heat by the connecting wires of the thermo-couple. Determinations of the radiant efficiency, or luminous duty, of the acetylene flame have been made by Messrs. Hoxie and Stewart, by the classical method of interposing heat-absorbing cells between the flame and a bolometer, and comparing the result with the indications of the naked flame. In this way, the radiant light efficiency was found to be 10·5 per cent. The same method applied to an "ordinary (gas?) flame," gave a radiant light efficiency of 2·9 per cent. This result is fairly consistent with older determinations—such as that of Julius Thomsen, 2 per cent. for a petroleum flame; and Langley, 2·4 per cent. for an argand gas-burner.

Notwithstanding its weaknesses, the acetylene flame can be used as a standard of colour of artificial light in spectrophotometry. With the air blowpipe, acetylene furnishes a non-luminous high-temperature flame of great usefulness and convenience in the laboratory, capable of fusing quartz or the metals of the platinum group. Mr. Nichols holds out some hopes of the success of a Methven-pattern photometric standard with the acetylene flame, when the necessary precautions are ascertained and followed.

At the meeting of the Institution of Mechanical Engineers on Friday, the 14th inst., Mr. Herbert A. Humphrey, of Northwich, will read a paper on "Power Gas and Large Gas-Engines for Central Stations."

THE PRIZES OF THE SOCIETE TECHNIQUE DU GAZ EN FRANCE.

We have received from the Secretary of the above-named Society a list of the premiums to be awarded next year. At the top stands the prize of 10,000 frs. (£400), previously offered by the Society, to be given, wholly or in part, to the inventor of a new incandescent gas-burner showing marked superiority over those now in existence. This burner should be in the hands of the Committee before the 1st of February next. A like amount will be awarded, wholly or in part, to persons who, in the opinion of the Committee, have effected some distinct improvement in the appliances used in the manufacture and use of gas; and a sum of 5000 frs. (£200) to those who have made any noteworthy progress in connection with apparatus employed for the utilization of coke. Three models of each appliance submitted must be placed before Feb. 1 next at the disposal of the Committee, who will indicate the works at which they will have to be delivered. Another sum of 5000 frs. will be distributed for the best chandeliers, brackets, and fittings, combining tasteful design with adaptability for use with incandescent gas lighting; account being taken of the increased illuminating power obtained by this system, and of the smaller sizes of service-pipes which will suffice in the future to obtain a specified luminosity. This is the prize which was decided upon at the International Gas Congress held in Paris in September. It is open to all comers; and those who intend to compete for it should apply to the Society, and send to them, before the 1st of March, a photograph of the appliance, accompanied by a description. The Committee will subsequently indicate the manner in which the appliance itself may be examined. Another prize of like value will be awarded, wholly or in part, to inventors who have effected improvements in the automatic lighting of gas-burners, notably those used with the incandescent system. This prize also will be open to all; and it will be awarded for systems which have been found to give the greatest satisfaction in practical working. As in the previous case, drawings and descriptions of the appliances submitted must be in the hands of the Committee before the 1st of March, accompanied by the names of the towns in which they have been adopted, and particulars as to the length of time they have been in use. Finally, a sum of 8000 frs. will be devoted by the Society to various prizes to the authors of the best papers on any subject of interest in connection with the gas industry; the respective amounts to be determined by the Committee in accordance with the value of the papers. These prizes are open to non-members of the Society, of whatever nationality; but the papers will have to be written in French. They must not bear the author's name, but merely a motto, as is customary; the name being sent in a sealed envelope endorsed with the selected motto. The author will have to make a declaration that his paper has not appeared in print, and give a guarantee that he will not publish anything on the same subject for a year. The manuscripts, with the sealed envelopes, must be addressed to the Society, No. 65, Rue de Provence, Paris, before the 1st of March; and they will remain in their possession.

PERSONAL.

Mr. W. D. Child, Engineer and Manager of the Romford Gas-Works, has been elected Worshipful Master of the Evening Star Lodge, No. 1719, for the coming year.

Mr. R. L. Andrews has resigned the position of General Manager of the Gas-Meter Company, Limited; and an annuity has been granted to him by the Directors. Mr. Andrews was appointed General Manager of the Company in 1881.

Mr. H. W. Cowling, Assistant to Mr. C. E. Ball, Engineer and Secretary of the Ilfracombe Gas Company, has been appointed Manager and Secretary of the Sherborne Gas Company, in succession to the late Mr. T. W. R. White. Mr. Cowling was with his father, at the Wallingford Gas-Works, for about nine years; leaving him to take the position at Ilfracombe, where he stayed six years. On relinquishing it to go to Sherborne, Mr. Ball presented him with a tea set, and the men with a tea service.

Mr. H. J. Ibbotson, Assistant to Mr. Charles Meiklejohn, of Rugby, has been appointed Manager of the Newport (Isle of Wight) Gas-Works, in succession to Mr. F. G. Cockey, who, as already announced in the "Journal," will shortly take charge of the New Swindon Gas-Works. Mr. Ibbotson, who is only 23 years of age, was Mr. Meiklejohn's first pupil, and on the completion of his articles remained with him for three years as Assistant; and the fact that he is deemed competent to take the more responsible position to which he has been appointed bears testimony alike to the efficiency of his training and to his own capacity.

According to the twelfth annual report on "Strikes and Lock-Outs," just issued by the Chief Labour Correspondent of the Board of Trade (Mr. John Burnett), there was no trade dispute last year of such magnitude as to unduly swell the statistics. The number of separate disputes was 719, as compared with 711 in 1898. In all other respects, the figures for 1899 are the lowest of any of the six years for which statistics are available for comparison.

NOTES.

The Gas-Igniting Power of Flames.

A curious remark on the gas-igniting power of luminous and other flames occurs incidentally in the Home Office report on the fire-damp explosion which occurred at Cwm Pit, Merthyr Tydfil, on May 14 last. It appears that the explosion in question injured four men, and raised the question (with which we are not particularly concerned) of the suitability of the explosive used on this occasion. It was a variety of gunpowder; and in the course of a series of experiments carried out by the Investigating Committee, attention was drawn to the appearance exhibited by this and other explosives when fired into the air out of a "stemmed" gun. In these circumstances, common gunpowder gives a somewhat large and luminous flare. The so-called high explosives, fired by a detonator, give a much less visible flame; some of them being almost flameless. This has given colour to the supposition that the latter are safer than the former. But it is remarked that, while to the eye the flame of a blown-out shot of powder is more luminous than that of a high explosive, quite different results are obtained by photographing the flames. Indeed, it cannot be said that the luminosity of a flame is any safe guide to its power of igniting gas. "A familiar example of this fact is to be seen in a common fish-tail gas-burner, which, though far brighter to the eye than the flame of a bunsen burner, is far less hot, and less likely to set fire to gases or other substances." No experimental confirmation of this remarkable new dictum is offered.

The Specific Heat of Gases at High Temperatures.

At a recent meeting of the Manchester Literary and Philosophical Society, Mr. Harold B. Dixon, F.R.S., Professor of Chemistry and Metallurgy in Owen College, communicated a summary of the results of experiments conducted in conjunction with Mr. F. W. Rixon, B.Sc., on the above subject. As part of a larger investigation, the authors have determined directly the specific heat of carbonic acid, up to 400° C., at constant volume. The gas is screwed up in a mild steel cylinder, which is heated in a gas-oven running on rails. The oven and cylinder can thus be brought quickly over the calorimeter, into which the cylinder falls through trap-doors forming the bottom of the oven. The transference is thus effected with a minimum loss of heat. The difficulties arising from splashing and from the escape of steam are overcome by dropping the cylinder into a glass tube dipping some distance below the water. The glass tube breaks at a crack made in the neck, and thus ensures complete immersion of the hot cylinder at a good depth in the water, which closes over the cylinder in a cataract. A similar experiment being performed with the empty cylinder, the difference gives the heating effect of the gas. The results stated below for carbon dioxide show that the method, which it is hoped may still be improved, is a workable one:—

Initial Temperature of Gas.	Final Temperature.	Mean.	Specific Heat.
115	16	65·5	0·200
192	16	104·0	0·211
298	21	159·5	0·288
398	21	209·5	0·356

The authors are now measuring the specific heat of nitrogen in the same way.

Side-lights on Russian Civilization.

A striking set of statistics relating to the methods of artificial lighting in use in literally "Darkest Russia," has been collected at the instance of the Naphtha Producers' Association. They illustrate the extreme thinness of the skin of civilization that has yet been spread over the profound barbarism of the country people of this vast geographical empire. The returns were obtained from local authorities and school teachers, who were circularized with a set of questions framed to elucidate the common practice of the people in regard to lighting their dwellings, and to ascertain the conditions of the local trade in kerosene. A summary of the information received has been published in the "Petroleum Review," from which it appears that Russian burning oil is very little used by home consumers. The annual consumption of burning oil for all purposes, taken over the entire population of Russia, is under 13 lbs. per head. In country districts, the people do without it. Where forests exist, the primitive method of lighting interiors, by means of strips of pine wood stuck in the wall, is almost entirely practised. All the vast districts in the north, north-east, and north-west, as well as those in the western parts of Central Russia, and in the Caucasus, use wood for lighting. In South Russia tallow-dip candles are the favourite means of lighting. In the very centre of the oil-fields, the people burn the crude oil by means of primitive chimneyless lamps. At least a quarter of the whole Russian population are still in the stage of torch-light. The wood slips (of pine and birch) used for this purpose, are dried by being kept overnight in the oven. This use of the wood torch is made a subject of folk-songs. Obviously, this prevalence of material darkness accounts for the existence of a low state of culture among the people. Eye diseases are also rife. High internal excise duties are chargeable with the small consumption of kerosene for lighting in Russia. In the towns, the retail price ranges from 1s. to 1s. 3d. per gallon. The former is the price in Baku itself, whence the oil is sent to England to be sold for less than one-half the money,

TECHNICAL RECORD.

MR. DIBDIN ON THE EFFECT OF QUALITY ON THE CONSUMPTION OF COAL GAS,

With Some Remarks as to the Results of Adding Water Gas to Coal Gas.

At an hour last evening too late for a complete report to be given this week, Mr. W. J. Dibdin, F.I.C., F.C.S., &c., read a paper, entitled "Coal Gas: Effect of Quality on Consumption," before the Society of Chemical Industry, at their meeting held at Burlington House.

The author started with the truism as to a clear comprehension of the effect of variations in the quality of coal gas upon the quantity of light obtainable therefrom being of no little moment. The use of coal gas, he proceeded to remark, purely as a heating agent raised another point entirely apart from that of the illuminating effect when the gas was consumed in the burners commonly employed. The question was also complicated by the recent introduction of incandescent burners or mantles, which very materially affected the question so far as the number employed bore any ratio to the total number of burners of all kinds in general use. If none but incandescent burners were employed, then it might be granted at once that the old idea of the "illuminating power" of coal gas must be very largely and seriously modified, so much so that the expression "heating power" might safely be used in its place. As long, however, as the great proportion of the gas was consumed in ordinary luminous flame burners, it must be admitted that there was no excuse for neglecting the effect of variations in quality upon the quantity of gas necessary to give normal or unit illumination. If the quantity of gas required to be burnt to afford any desired degree of illumination was a variable factor, and the gas so employed was charged for at a uniform rate for each cubic foot used, the actual cost of that degree of illumination must vary with the quantity. Thus, a gas of higher price, but of higher quality, might be far cheaper to the consumer than a gas of lower price but lower quality. These two factors must be taken together; and, to obtain a proper estimate of their ratios, the conditions under which the gas was to be consumed must first be determined, as these conditions would materially affect the problem. Taking the extremes, for instance, the value might depend upon quantity only if the basis were that of the incandescent burner. But even then the heating value of the gas should be taken into account. On the other hand, if the basis were that of a flat-flame burner, then the value must depend upon illuminative effect, as well as on the quantity required to be consumed.

Having thus prefaced the main part of his paper, the author said to assist in clearly establishing the effect of consuming gases of different qualities in the burners commonly employed, as well as in the standard argand and incandescent burners, he had conducted a number of tests, with various burners and different qualities of gas, in regard to the quantity required to yield the maximum amount or normal light from any given burner when consuming 16-candle gas under the most suitable conditions. Following upon a preliminary series of experiments of a limited character, six series of photometrical tests were arranged. The first with coal gas at Widnes; the second, with the Gaslight and Coke Company's gas; the third, with the South Metropolitan Gas Company's gas; and the next three with various proportions of coal and water gas. For the first series, Mr. Isaac Carr, of Widnes, stored different qualities of gas from time to time in an experimental 100-feet holder, which was connected to the author's photometer. The procedure was to first carefully test the illuminating quality of the gas when burnt at the rate of 5 cubic feet per hour in a No. 1 "London" argand burner, and then to burn it in various gas-burners in succession—making photometrical determinations of the light, and estimations of the consumption of gas.

Gas of an illuminating power of 16·2 candles when consumed at the rate of 5 cubic feet per hour in the standard argand burner was used in the first series of tests. The value named was ascertained by independent tests by different observers using the closed Evans photometer on the works, employing candles as a standard, and the author's portable bar photometer, with Dibdin's 10-candle pentane argand standard, as was recommended by the Board of Trade Committee. The standard argand on the portable photometer was then removed, and a Sugg's table-top No. 4 burner was placed in position, and the gas adjusted until a fair and even burning flame was obtained, which was found to be equal to 14·4 candles. The consumption of gas, as indicated by the experimental meter, was at the rate of 5·3 cubic feet an hour. In like manner 28 burners were tested in succession with the same gas, with the results recorded in a large table exhibited by the author. The tests were repeated, in a precisely similar manner, with gas of another quality. In this way, it was ascertained that the flat-flame burner first tested—Sugg's No. 4 table-top—which gave 14·4 candles with 5·3 cubic feet per hour of 16·2-candle gas, required, to produce the same illumination, 6·1 cubic feet per hour when the illuminating power of the gas was reduced to 15·2 candles, 6·4 feet with 14·2-candle gas, 7·75 feet with 13·5-candle gas, 9·7 feet with 12·2-candle gas, and 11·2 feet with 11·2-candle gas; while, when the quality of the gas was raised to 17·2 candles, the consumption required to yield the same unit or normal lighting power of 14·4 candles was reduced to 4·5 feet, and with 19·2-candle gas the consumption was only 3·9 feet.

Having referred to other tabular comparisons, the author said that with low-grade gas, the burners could not, in certain instances, properly consume sufficient gas to give the amount of light afforded when the 16-candle gas was employed, and corrections had therefore to be applied. Thus, in the case of Sugg's No. 7 table-top burner, 24·6 candles were obtained with gases down to 12·2 candles; but when 11·2-candle gas was used, only 20·2 candles could be realized. As the consumption was 10·8 cubic feet per hour, 13·1 feet would have been necessary to yield the 24·6 candles. These corrections more particularly applied to burners adapted for very rich gases when employed with low-grade gases. On the basis of a sufficient number of burners being employed to consume the total quantity of gas of a given quality to yield the volume of light required, this method of approximation would probably give slightly too low a result.

Reference was next made to a diagram showing the effect of any alteration in the quality upon the actual cost of the gas required to produce unit light with certain representative burners. On the left-hand side of the diagram, the volume of gas was indicated in terms of percentage for the various abscissæ, and on the right-hand side, the corresponding increase or decrease in the cost was shown, on the basis that 16-candle gas cost 2s. 6d. per 1000 cubic feet. Ordinates indicated the candle power of the gas supplied; and curves represented the unit or normal intensity of the light yielded by the respective burners when burning 16-candle gas with a consumption most suited to them. The bottom curve on the left-hand side of the diagram cut the ordinates for 19·2-candle gas on the abscissa, representing 60 per cent. of the quantity of gas required when 16·2-candle gas was employed. This curve then proceeded upwards until it crossed the ordinate representing 17·2-candle gas, which cut the abscissa for 83 per cent. of normal value. The curve then crossed the ordinate for 16·2-candle gas on the abscissa for 100 or normal volume. The curve then proceeded until it cut the ordinate for 15·2-candle gas on the abscissa for 134 per cent.; and in like manner the ordinate for 14·2-candle gas at 180 per cent., 13·5-candle gas at 220 per cent., 12·2-candle gas at 305 per cent., and the ordinate of 11·2-candle gas at about 380 per cent. Then, interpreting the variations in consumption of gas into relative cost as indicated on the right-hand side of the diagram, it would, the author said, be seen that, to obtain equal degrees of illumination with varying qualities of gas in the case of a No. 4 Bray's burner, the actual cost of the gas to the consumer on the basis of light for money would be as follows:—

Illuminating Power of Gas.	Quantity required to give Light equal to 1000 Cubic Feet of 16-Candle Gas.	Actual Cost of Gas at 2s. 6d. per 1000 Cubic Feet.
Candles.	Cubic Feet.	s. d.
19	600	1 6
18	700	1 9
17	820	2 1
16	1000	2 6
15	1340	3 4
14	1800	4 6
13	2400	6 1
12	3040	7 9
11	3750	9 6

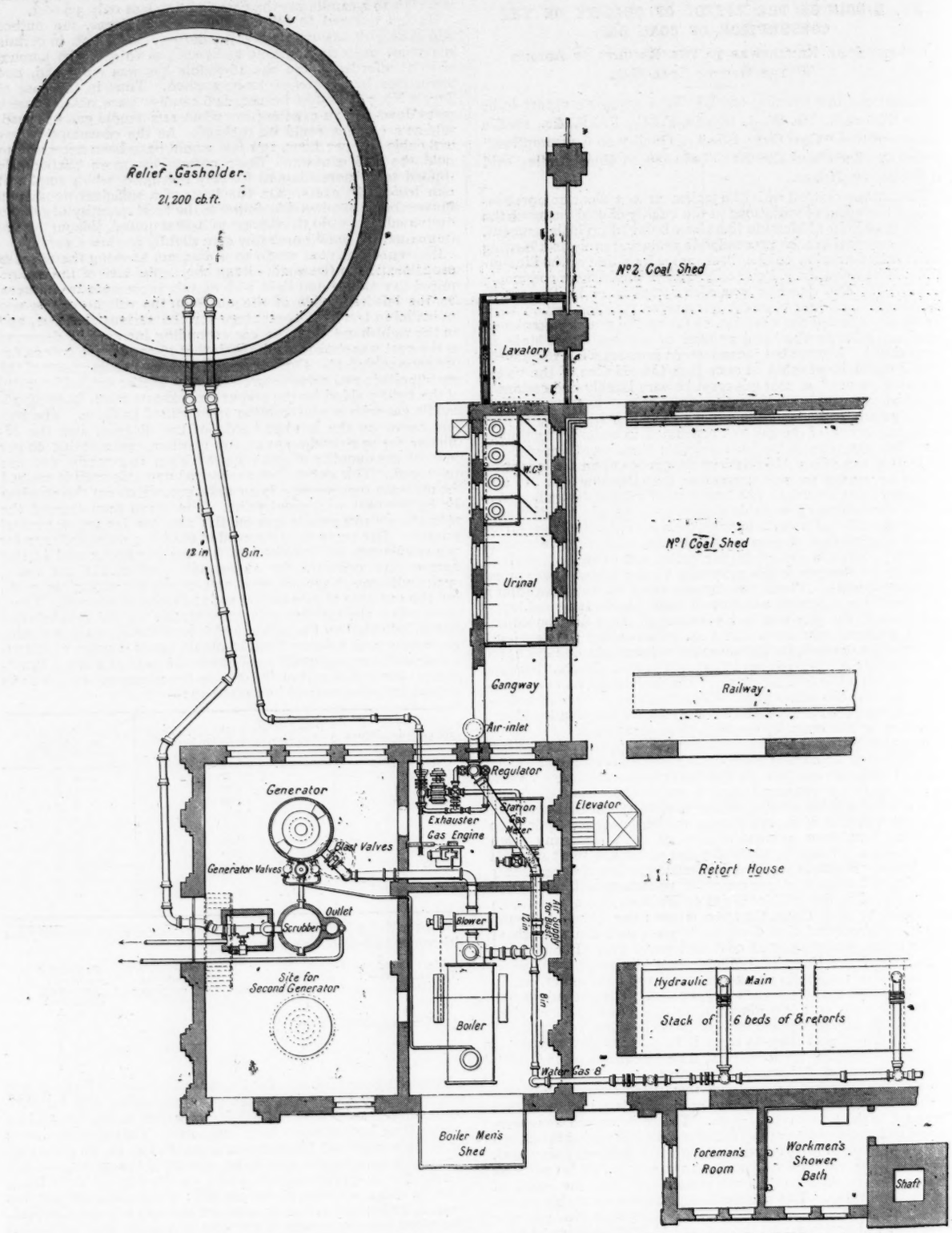
With a No. 5 Bray burner, the cost of equal light intensity for different qualities of gas was—

Illuminating Power of Gas—Candles.	Cost of Gas per 1000 Cubic Feet. s. d.	Illuminating Power of Gas—Candles.	Cost of Gas per 1000 Cubic Feet. s. d.
19 ..	1 7	14 ..	3 7
18 ..	1 10	13 ..	4 3
17 ..	2 1	12 ..	5 4
16 ..	2 6	11 ..	7 1
15 ..	3 0		

Remarking on this, Mr. Dibdin said that, on this basis, it was seen that any variation in price per 1000 cubic feet for each candle alteration in the illuminating power of the gas should be greater than had hitherto been supposed. On the other hand, these facts explained the common complaint as to the otherwise apparently inexplicable rise in the amount of the gas bills—a fall of 2 candles in quality causing a rise, in the case of Bray No. 5 burners, of 44 per cent. in the gas bill; while when the gas was down to 12·6 candles, the amount of the gas bill was doubled. Therefore any discussion of the cost of gas per 1000 cubic feet was valueless in the absence of an equal recognition of its quality. With Welsbach and the best argand burners (which, however, were used to only a very limited extent as compared with flat-flame burners), the results were, the author pointed out, less disproportionate, and a moderate reduction in price for each candle power would not be unreasonable. Unfortunately, however, to obtain a problematical advantage to the users of gas for heating purposes, the vast majority of those consuming gas for illuminating purposes in burners commonly employed, would be mulcted to a most unjust and injurious extent.

The foregoing results having been obtained with specially prepared gas, the author deemed it advisable to repeat the experiments with gas actually supplied to consumers. Consequently a second series of tests was made with gas supplied by the Gaslight and Coke Company. To obtain gas of very low

ERFURT GAS-WORKS.—For Description, see pp. 1386-87.

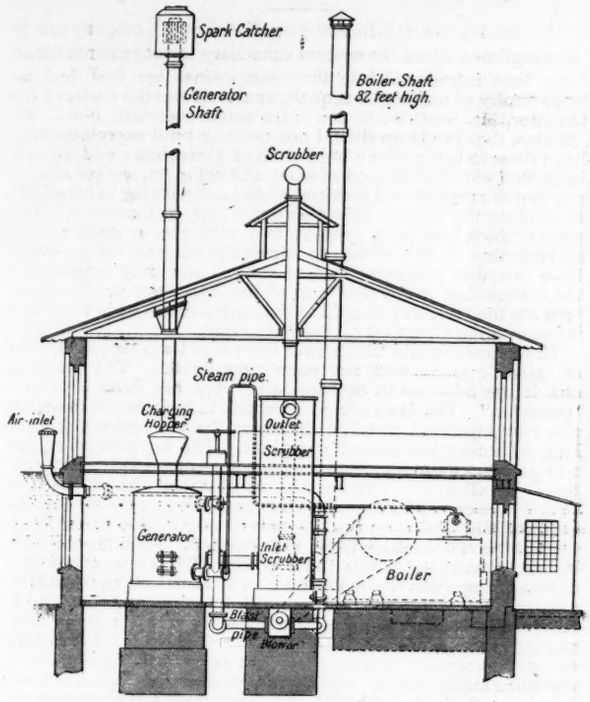


General Plan of Water-Gas Plant and Connections.

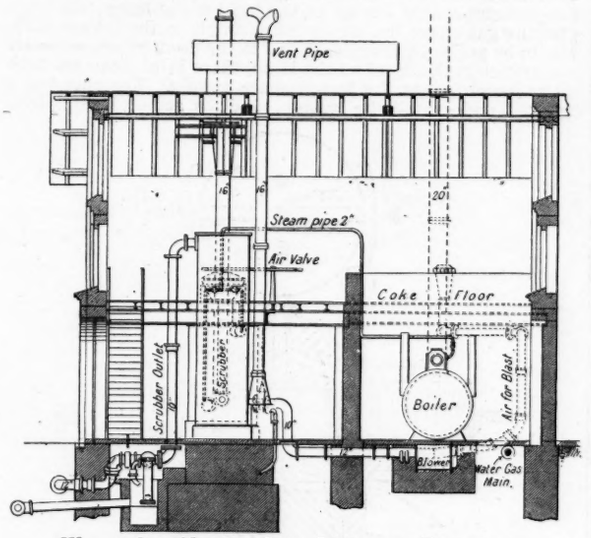
illuminating power, the ordinary supply was stripped by passing it through a coke scrubber; the coke being moistened with linseed oil. Richer gases were obtained by the addition of petroleum to the ordinary supply, and allowing the mixture of petroleum vapour and coal gas to stand for some hours in a holder before making the tests. A third series was made, in similar manner, with gas supplied by the South Metropolitan Company. The results (which were set out in tables on view) confirmed those previously made.

To ascertain the effect of the use of water gas, the author conducted a similar series of tests—first, with a mixture of lower power coal gas and water gas in varying ratios; and, secondly, with mixtures of high-power coal gas and water gas. The figures showed that, with increased percentages of water gas, the quantity of gas required to give unit light with a No. 4 Bray burner rose to as much as 160 per cent.; while with the standard argand burner, the increase was only 6 per cent., and with the Welsbach mantle it was *nil*. In the tests with high-power coal and water gas, with a No. 4 Bray fishtail burner, the increase in consumption was 250 per cent. with 75 per cent. of water gas; but with the standard argand there was no increase, while with the Welsbach mantle there was an actual decrease in the consumption of 7 per

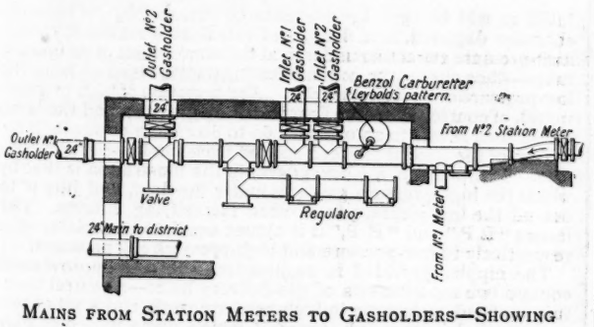
ERFURT GAS-WORKS.—See pp. 1386-87.



WATER-GAS HOUSE—END SECTIONAL ELEVATION.



WATER-GAS HOUSE—SIDE SECTIONAL ELEVATION.



MAINS FROM STATION METERS TO GASHOLDERS—SHOWING POSITION OF CARBURETTER.

cent. Shortly, the results of the water-gas series were that dilution of coal gas with equal power water gas had the same effect in many burners as that produced by a reduction in the illuminating power of the gas—*i.e.*, a larger quantity of gas had to be consumed to obtain the same illumination; while the use of excessive quantities of high-power water gas as an enriching agent was without the commensurate advantages that might have been anticipated—viz., such as were obtained from the use of benzol, cannel, &c.

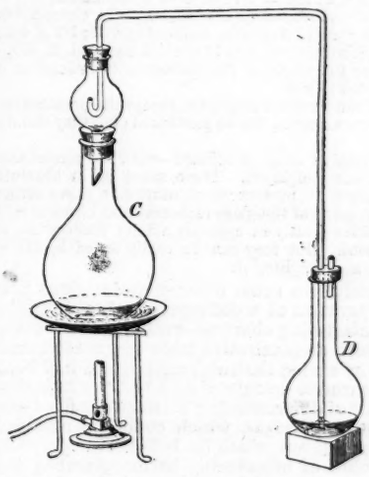
THE VALUATION OF GAS LIQUOR.

A Meeting of the Nottingham Section of the Society of Chemical Industry was held last Wednesday at the Municipal Technical College, Derby—Dr. F. STANLEY KIPPING, F.R.S., in the chair—and in the course of the evening, Mr. F. J. R. CARULLA, F.C.S., read a paper of special interest to our readers, on "The Valuation of Gas Liquor."

Mr. Carulla pointed out that, although containing other components sometimes of use, the ammonia is the only one generally valued in gas liquor, the large bulk of which is still produced by coal-gas works. Chemical manufacturers at one time almost exclusively worked up this liquor; but gradually the business was becoming more and more one for the gas manager. Some reasons for this change were clear enough. Liquor with an average of 2 per cent. of ammonia would not stand heavy carriage charges; and large gas-works away from chemical works must, therefore, deal with it themselves. Other reasons did not lie so much on the surface. Those depending on the fluctuations of the sulphate of ammonia market, the author made an attempt to remove. Gas liquor was, he pointed out, often sold for long periods at a fixed price; and as the chemical manufacturer could not insure himself by selling sulphate for a sufficiently long time ahead, he was frequently compelled to offer what might not be thought a fair price for the liquor. Hence a sliding-scale of prices suggested itself as a solution of the difficulty. Naturally the methods for taking the strength of the liquor were matters of importance. The author said he found that, up to 4° Twaddel, it was quite safe to use the hydrometer. Above 4°, the true strength was generally a little higher than the Twaddel strength. But a fair allowance could always be made in the price paid for the liquor, so as not to lose the convenience of so simple a method of testing. Where the hydrometer was inapplicable—as in ammoniacal liquor from tar-stills, &c.—the distillation test must be resorted to; and Mr. Carulla said he was glad to be able, by the kindness of Mr. John Phillips, the Secretary of the Bristol Gas Company, to give particulars of the modification they adopt. It was an instructive description, and was besides of special interest—being issued to would-be contractors for the purchase of their gas liquor with the forms of tender to be filled in with prices on a sliding-scale based on the market value of sulphate of ammonia. The description was as follows:—

Method of Testing Ammoniacal Liquor.

The facts upon which this method is based are as follows: When a mixture composed of solutions of ammoniacal salts and a sufficient quantity of some caustic alkali for which the acids of the salts have a stronger affinity than for ammonia is boiled for some time, the whole of the ammonia is driven off in a gaseous state, and may be secured as sulphate by bubbling into a solution of sulphuric acid.



The apparatus employed consists of a sand-bath, heated by means of a bunsen burner; a flask C furnished with an india-rubber stopper, fitted with funnel having a glass stopcock, and also an eduction tube, having the end which fits into the flask C ground off to an angle of about 60°; a second flask D; two properly graduated burettes of such capacity as to contain 60 c.c. of liquid each, and divided into 0·1 c.c.

The solutions employed are: (1) A strong solution of caustic soda, made by dissolving 10 grammes of pure caustic soda in 100 c.c. of distilled water; (2) a normal solution of sulphuric acid, in which 1000 c.c. contain 49 grammes of sulphuric acid (H_2SO_4); (3) a normal solution of caustic soda, in which 1000 c.c. contain 40 grammes of caustic soda (NaHO).

These normal solutions are prepared as described hereafter, and equal measures taken of each shall, when mixed together, exactly neutralize each other, and shall neither show acid nor alkaline reaction to a colouring imparted to the solution by the addition of a drop or two of methyl-orange solution, which is the indicator of acidity, alkalinity, or neutrality of a solution, and is made by dissolving 1 gramme of methyl orange in 1000 c.c. of water.

Normal Test Acid Solution.—To prepare. Place 30 c.c. of pure concentrated sulphuric acid (sp. gr. 1·842) into 1 litre of pure distilled water, mix carefully, and allow it to cool. The solution will contain rather more than 49 grammes of H_2SO_4 per litre. To determine its exact strength, weigh out about 2 grammes of recently heated pure carbonate of soda made by heating pure bicarbonate of soda for ten minutes at a dull red heat in a platinum dish. Add distilled water, boil, allow to cool, and add a drop or two of methyl-orange solution. Then titrate with the acid solution, until the colour imparted by the methyl orange changes to a pale straw colour. 100 c.c. of standard sulphuric acid solution should exactly neutralize 5·3 grammes of pure carbonate of soda.

Calculation.—As 5·3 grammes of carbonate of soda exactly neutralize

100 c.c. of standard sulphuric acid solution, then as 5·3 : 100 : : 2 : x; x = 37·74—*i.e.*, the number of "c.c." of standard sulphuric acid solution required to exactly neutralize 2 grammes of carbonate of soda. Say, for example, that 36 c.c. of the standard acid solution was found necessary to be used, instead of 37·74, then it is too strong, and by deducting 36 c.c. from 37·74 c.c., 1·74 c.c. remain. Therefore, it is apparent that 1·74 c.c. of distilled water must be added to each 36 c.c. of the acid solution in order to make it a standard normal acid. Consequently, the number of "c.c." of distilled water required to be added to each litre will be as 36 c.c. : 1·74 c.c. : : 1000 c.c. : y; y = 48·3 c.c.

Normal Test Caustic Soda Solution.—To prepare. Put 44 grammes of pure caustic soda into 1 litre of distilled water, and when dissolved allow it to cool. This solution will be a little too strong. To standardize it, use the normal solution of sulphuric acid, 1 c.c. of which must exactly neutralize 1 c.c. of the caustic soda solution.

Calculation.—Say that 19 c.c. of the above mixed caustic soda solution neutralizes 20 c.c. of normal sulphuric acid solution. Then the caustic soda solution is too strong. To each 19 c.c. of it, must be added 20 c.c. — 19 c.c. = 1 c.c. of distilled water, or to each litre 52·6 c.c. of distilled water. Then equal measures of this and the normal acid mixed together will exactly neutralize each other.

Assuming that all the vessels are perfectly clean, that the flask C has been placed in the sand-bath, and that the junctions are all perfectly tight, the operations are commenced by charging the flask D with 50 c.c. of the normal test acid. The flask is then placed in position so that the end of the eduction tube is within ¼ inch from the bottom of the flask. 200 c.c. of water is next poured into the flask C, and 20 c.c. of gas liquor added, and the india-rubber stopper placed in the flask C. 20 c.c. of the *strong soda solution* must now be poured into the funnel, the cock opened, and closed immediately after the fluid has run down into the flask. The bunsen burner, on being lighted below the sand-bath on which the flask C rests, raises the contents to boiling-point, at which temperature it must be kept until two-thirds of the contained liquor is evaporated, by which time the whole of the ammonia will have passed over into, and will have been absorbed by, the normal test acid contained in the flask D.

The crackling noise which sometimes occurs at the commencement of boiling—caused by the rapid absorption of the ammonia by the acid in the small flask—need cause no alarm.

When the ammonia has ceased to come over, the flask D is removed and allowed to cool, and its contents then coloured by the addition of a few drops of the methyl orange solution.

The burette having been charged with 60 c.c. of normal test solution of soda, and the flask D placed upon a white paper or glazed white tile in a good light, the solution in the burette is dropped into the flask until the red liquid therein changes to a pale straw colour.

The strength of the gas liquor subjected to test is indicated by the number of "c.c." of normal soda solution used in titration, subtracted from the number of "c.c." of normal acid used to absorb the distilled ammonia. Thus, if 30 c.c. of soda solution be drawn from the burette, then, as 50 c.c. of test acid were taken, 50 c.c. — 30 c.c. = 20 c.c., being the number of "c.c." of the test acid neutralized by the ammonia in the gas liquor.

Each "c.c." of these two normal solutions corresponds and is equal to 0·017 gramme of ammonia (NH_3); 20 c.c. are therefore equal to 0·34 gramme of ammonia. But as 20 c.c. of gas liquor were taken, 20 c.c. : 0·34 gramme : : 100 c.c. : x. x = 1·7 per cent. of ammonia.

The "Ounce" or "Acid" Strength of the Liquor.—To change the percentage into "ounce" or "acid" strength, multiply by 4·61; 1·7 × 4·61 = 7·83, which represents the number of ounces of sulphuric acid (H_2SO_4) it would take to neutralize the whole of the ammonia contained in a gallon of the liquor subjected to test.

All the operations are of the simplest character, except the preparation of the test solutions. These, however, can be purchased; but they should always be checked.

One important matter remains to be mentioned—viz., the correctness of the measures and burettes employed. These must be in absolute agreement one with the other in measurement, otherwise grave errors will arise. Unfortunately, many of the glass measures and burettes sold are very inaccurate, and differ greatly in capacity among themselves, to the extent of 5 or 6 per cent. But they can be easily tested by filling them with distilled water, and weighing it.

The author went minutely into some other considerations that should govern the preparation of a sliding-scale—including the fixed and varying manufacturing charges—evolving a formula of easy application, by which an illustrative table was constructed. Mr. Carulla concluded by saying that, although figures had been used for the sake of clearness, he only wished to draw attention to a principle—viz., that of differentiating between the fixed and the varying manufacturing charges, which could be modified according to circumstances, but which he believed, if properly applied, would be capable of introducing harmony among the contending interests of the gas and the chemical industries.

The CHAIRMAN said he was surprised to hear that anyone used the hydrometer as a test for gas liquor. He understood that the liquor was bought and sold by the "ounce strength."

Mr. CARULLA remarked that the ounce strength obtained by saturation of the liquor with sulphuric acid also failed to give a true indication in many instances.

The CHAIRMAN said: Precisely; the ascertainment of the ounce strength by the distillation test is what I refer to.

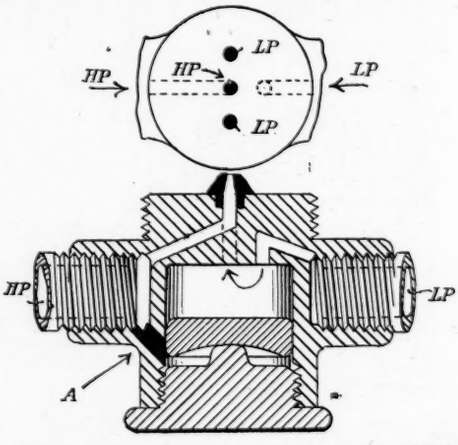
Mr. CARULLA: I have experience of more than a dozen gas companies by whom the hydrometer is found a convenient and reliable instrument. Of course, when buying liquor from tar distillers a distillation test is indispensable, as in that case the hydrometer gives no indication of the strength.

The memorial to the late Mr. G. J. Symons, the distinguished meteorologist, for which public subscriptions were invited a short time since, is to take the form of a gold medal, to be awarded from time to time by the Royal Meteorological Society for distinguished work in connection with meteorological science.

THE SCOTT-SNELL SELF-INTENSIFYING LAMP.

The Scott-Snell Self-Intensifying Gas-Lamp Company are to be complimented on the several subsidiary improvements which they have introduced into their lamp since we first had an opportunity of making its acquaintance. It was the desire of the inventor, Mr. Scott-Snell, and of his active associate, Mr. C. W. Phillips, that the lamp should not go forth until everything had been done to bring it to a high pitch of perfection; and, having been kept closely informed of what was going on, we are able to say that the first-named gentleman has been untiring in his efforts to produce the highest refinement and best performance. The course which has been pursued is a wise one, as even a little imperfection at the outset in hurriedly finished lamps might have retarded progress; and, as it is, it now only remains for the completion of the provision of the necessary machinery to turn out the lamps at a rapid rate, to meet the already abundant influx of orders from all parts of the globe.

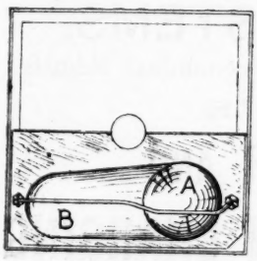
The improvements which have been made will be found to be of intrinsic value, and not mere superfluities. The principal one is the addition to the design of what has been termed a "reverter." This is an accessory which, though simple in action, plays an important part in maintaining the self-sufficiency of the lamp as a complete intensifying plant. The appellation of this new part is an apt one; and in some measure it is self-explanatory. At all events, the description will show that it removes entirely the one objection which has been advanced—that, in the event of any mishap to the pressure-raising section of the lamp, the light would be completely extinguished. Such an objection is now groundless. From the first, one of the commendations of these lamps was the independence of each unit as regards its fellows. Decentralization, it seemed, had then been carried to its utmost extent, inasmuch as each lamp was unable to exert any influence on its neighbours; but each lamp by means of the reverter is now, if one may use the expression, subdivided to minimize local trouble. Simply the reverter accomplishes this: The lamp starts its work with the gas at ordinary pressure; the heat from the incandescent mantle brings into operation the gas-pressure-raising device in the head of the lamp; the high-pressure gas closes the low-pressure supply to the burner in the way to be presently described; and in the event of any untoward occurrence in the head of the lamp, there is at once an automatic reversion to the low-pressure supply. The reverter is situated underneath the burner; and its action is simplicity



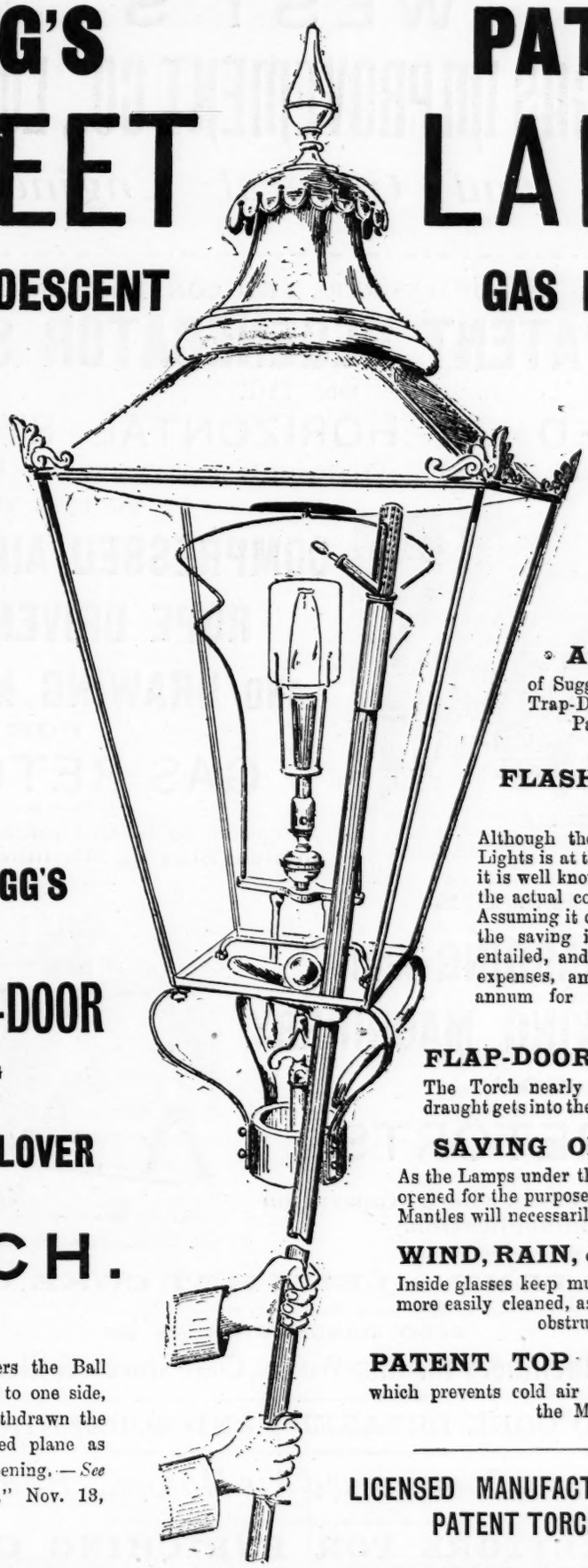
itself, as will be seen by reference to the sketch. Within the chamber depicted, is a float; and this float is retained, by the high-pressure gas acting under it, at the utmost limit of its upward range—thus closing the communicating passage leading from the low-pressure or ordinary service. Any cessation of high pressure would, of course, allow the float to fall by gravity; and the lamp would then revert to an ordinary 60 to 80 candle power light by reason of the special gas-feed opened from the low-pressure service. The passage A (shown dark) in the illustration is that by which the high-pressure gas gets under the float, and lifts it to cut off the low-pressure feed when intensifying obtains. The letters "L P" and "H P," it is almost needless to explain, refer respectively to low-pressure and high-pressure gas passages.

The nipples provided in conjunction with this improvement contain two separate sets of gas-delivery holes—a central aperture confined exclusively to high-pressure work, and a set of two or more holes arranged around it which come into play only when the intensifier is out of action, and the connection with the low-pressure pipe opens up by the fall of the float in the reverter. The importance of this type of nipple will be recognized, when it is remembered that, before the lamp intensifies, the bottom of the gas chamber must be heated. By the reverter coming into play, the lamp starts as a 60 candle to 80 candle power lamp, the heat of which quickly tells on the vessel carrying the displacer, and expanding the gas therein, puts the lamp into action. (Of course, it is assumed that the reader is acquainted through our previous article—see *ante*, p. 409—with the operation of the intensifying part of the lamp.) The failure of a lamp to intensify

SUGG'S PATENT STREET LAMPS FOR INCANDESCENT GAS LIGHTING.



PLAN OF BOTTOM OF LAMP.
A. Ball.
B. Inclined Plane.



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FOR LIGHTING WITH THE

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TORCH.

The Torch, as it enters the Ball Trap-Door, pushes the Ball to one side, and when the Torch is withdrawn the Ball runs down the inclined plane as shown, and closes the opening.—*See "Journal of Gas Lighting,"* Nov. 13, 1900, p. 1203.

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Although the usual charge for Flash-Lights is at the rate of $\frac{1}{2}$ cub. ft. per hour, it is well known to Gas Engineers that the actual consumption is far heavier. Assuming it only amounted to $\frac{1}{3}$ cub. ft., the saving in By-Pass Gas, Labour entailed, and other necessary incidental expenses, amounts to over £80 per annum for each District comprising 80 Lamps.

FLAP-DOORS ABOLISHED.

The Torch nearly fits the opening and no draught gets into the Lamp when being lighted.

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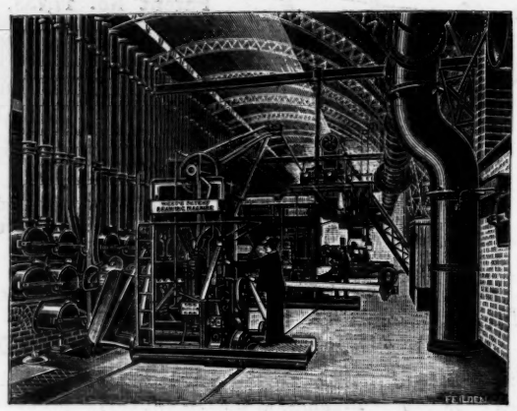

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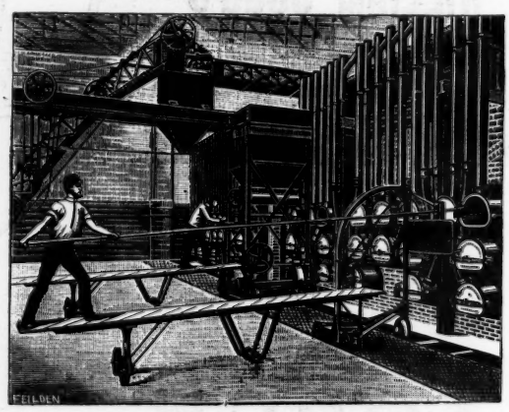

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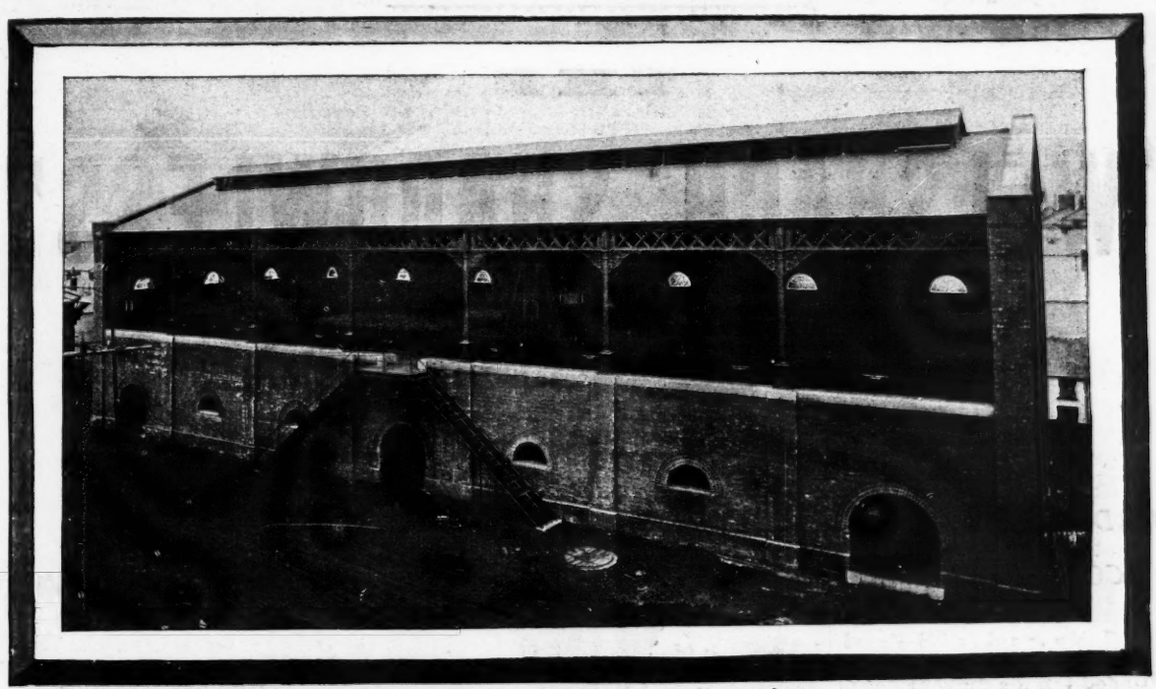

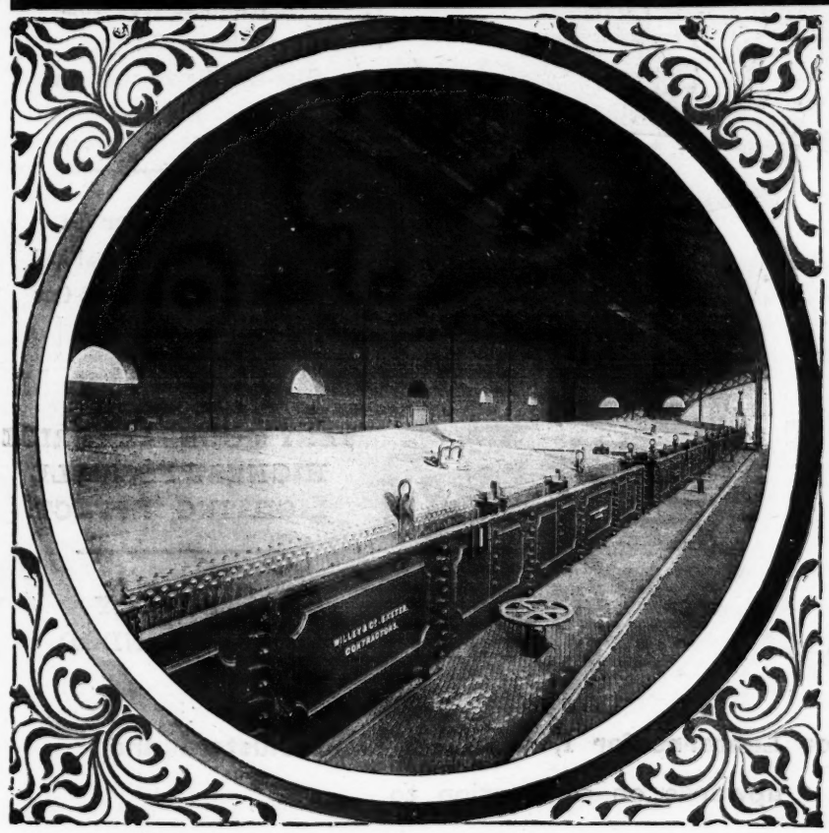

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Glass Cylinders Renewed at Small Cost.

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would simply mean that, while all its neighbours were giving the full volume of 300-candle power or more, the defective one would merely descend to the level of the ordinary incandescent street light. The disaster to the whole circuit which would result from motor failure in a machine-sustained high-pressure service is not only absent, but extinction even in a single lamp is thus rendered practically impossible. We have had an opportunity of testing how smoothly and immediately the reverter answers the cessation of the high-pressure supply.

Other items which make for reliability in construction and ease of examination may be found in the lamps. The reservoir or drum, which constitutes an anti-pulsator, instead of forming part and parcel of the main body of the lamp is now arranged as a separate body, and is so buried inside the water-head that it is quite unnoticeable. It can, however, be easily detached and examined or tested. In spite of intermittent delivery, which naturally obtains in an apparatus involving alternate suction and expulsion of the gas, the light is maintained quite steady by the addition of this small drum, which is only 8 inches in diameter and 6 inches deep. Such simple and direct methods of overcoming difficulties are characteristic of the design of the lamp, and exhibit great ingenuity and skill on the part of the inventor.

The component parts of the lamp are also now materially reduced in number by the clever way in which sheet metal is formed up under pressure, so that in a single piece of metal are combined those parts which would in general practice require multiplicity of pieces with riveted or screwed attachment. Joints —always a trouble, particularly in such a structure as this lamp, in which tightness is an essential to the maintenance of high pressure—are reduced to a minimum, and hand labour is much economized. Castings, with the accompanying labour of machinery and fitting, have been almost eliminated from the design; so that lightness, rapidity of formation, quickness of erection, and interchangeability have received full consideration.

As we have already indicated, and as is not astonishing, the invention has drawn to itself attention from the uttermost parts of the earth. Not only have numerous municipalities, gas companies, and other large industrial concerns in the United Kingdom sent in pressing orders for lamps, but demands have been made from such far-away places as Japan, India, Australia, North and South America, and, nearer home, from a number of European cities. The preparations for the manufacture have, however, absorbed considerable time and close application; and it will probably be the end of the year before regular supplies of the lamps will be obtainable. At the Company's new London works (where, by the way, lamps may be seen in operation, and arrangements have been made for photometrical testing), the dies for stamping out the parts and other tools, which are excellent examples of such work, have been produced under the personal supervision of Mr. Maurice Lachman, the Managing-Director of Messrs. J. F. Pease and Co., Limited. But the manufacture of the lamps in bulk will be carried on in Darlington, where plant is at the present time being laid down equal to a large output.

For want of a more convenient place, it may be mentioned in conclusion that the pressure of 36 inches can now be attained in these lamps, although not required; but it shows that the lamp possesses a considerable reserve margin. It is the intention of the Company not to confine themselves to lamps containing single burners, but clusters of lights in a single lantern will also be produced.

Private Bill Legislation for Next Session.—Next year promises to be a busy one in regard to Private Bill legislation, no fewer than 362 notices having been given for Bills or Provisional Orders. There will be 47 measures relating to the supply of gas, 40 to that of water, and 103 to the supply of electricity for light and power. A novel feature this year has been the deposit of 22 notices and plans under the Private Legislation Procedure (Scotland) Act of last year.

The Chairmanship of the Commercial Gas Company.—Mr. William Graham Bradshaw has been appointed Chairman of the Commercial Gas Company in the place of the late Mr. John Blacket Gill; and Mr. Walter Hunter, M.Inst.C.E., succeeds Mr. Bradshaw as Deputy-Chairman. The family of Mr. Bradshaw have a long and distinguished connection with the Company. His grandfather, Mr. Charles Salisbury Butler, M.P., was the first Chairman, from its incorporation in 1847 until his death in November, 1870; and his father, Mr. Richard Bradshaw, was Chairman from September, 1875, until his death in January, 1889. To each of these gentlemen the Company is indebted for services of no common order. In its earlier and stormier period, the sagacious counsels and material support of Mr. Butler preserved it from what might otherwise have shipwrecked the young undertaking; while in 1875, Mr. Richard Bradshaw was at the helm, and piloted his Company successfully through the critical parliamentary passage which resulted in the establishment of the sliding-scale. Mr. Walter Hunter, the new Deputy-Chairman, is the Engineering Director of the Grand Junction Water-Works Company, and is Joint Engineer with Mr. Reginald E. Middleton, M.Inst.C.E., of the Staines reservoirs scheme, the inception of which is due to him. Mr. Hunter, in association with the late Mr. Fraser, submitted the scheme to Lord Balfour's Commission of 1892-3, and it was highly approved by them. The first portion is now fast approaching completion.

REGISTER OF PATENTS.

Measuring the Rate of Flow of Liquids or Gases through Tubes, and Mixing or Delivering them in Given Proportions.—Rabe, H., of St. Petersburg. No. 21,772; Oct. 31, 1899.

According to a well-known physical law (the patentee remarks), the volume of a gas or a liquid passing through any opening depends upon the relative pressures on either side. In some known forms of measuring apparatus constructed upon this principle, a fixed contraction in the tube through which the liquid or gas passes is employed; and the varying velocity of the fluid in the tube is measured by the reduction of pressure caused thereby. The total cross-section of the contraction corresponds, in such forms of apparatus, to the mean velocity from which to calculate; while very low and very high velocities—that is to say, the extreme velocities—cannot be calculated with sufficient accuracy, and frequently not at all, for the reduction of pressure varies as the square of the velocity, and the results are therefore too small for low velocities and too great for high ones. These deficiencies have led the inventor of the present method of measurement to construct a resistance consisting of a throttling device, which can be adjusted to the varying velocities of the fluid without interrupting its flow, and which will also show visibly the size of the throttled passage—in other words, the degree of throttling—for any position in which it may be set.

To this end, there is employed any mechanism which can be opened or closed for the attainment of a predetermined difference of pressure—the method being practically similar to a weighting operation, in which the load is approximately counterpoised with weights, and the remaining difference measured upon the scale-beam; whereas in the method employed when using the known apparatus before referred to, the subsidiary scale alone is employed. The velocities of gaseous and liquid fluids are in this way enabled to be estimated within a very wide range, by means of a single piece of apparatus and under any difference of pressure. Furthermore, the apparatus permits of the throttling action being suspended (without interrupting the flow of the fluids) whenever desired, allowing the whole cross sectional area of the tube to be filled—an operation which is frequently necessary when dealing with liquids, to remove stoppages in the pipes, or to control the cross sectional area of the throttling device.

Pressure-Gauge.—Guest, J. J., of Birmingham. No. 22,373; Nov. 9, 1899.

The claim of the inventor is for "a pressure-gauge constructed of a tube, the cross section of which is elliptical (or other than circular), twisted about its axis so that the corresponding points of the various cross sections lie upon helices around the axis of the tube, which axis may be either straight or curved—the distortion which is observed to determine the pressure being that due to the integration of the effect of the twist of the elements of the length of the gauge-tube."

Gas-Ignition Pills.—Martini, A., of Berlin. No. 24,392; Dec. 7, 1899.

In the course of his specification, the patentee points out that, since the discovery of the catalytic properties of the metals of the platinum class, numerous attempts have been made to manufacture "effective and durable gas-ignition pills;" the substances most generally employed being platinum in a state of very fine distribution and meerschaum. Care has, however, to be taken, not only to distribute the platinum metals as thoroughly as possible in the pores of the pill-body, and to separate the single particles by heterogeneous substances, but also to avoid a melting of the pill-body, which would form a hindrance to the entrance of the gases; and, finally, the strong hygroscopic tendencies of the pill substance have to be taken into account. He claims that all this may be effected, in a thorough and effective manner, by adopting the method described—using meerschaum, platinum metals, and rare earths (combinations of thorium and platinum), as referred to in his English patent No. 22,901 of 1898.

The principal improvement now suggested consists in the manner of treating the materials to form the ignition pill. At the present time, pieces of meerschaum are impregnated with platinum chloride, and the latter reduced; and generally after this operation the soluble parts of the meerschaum are removed. This process is said to be by no means perfect; and it has been found far more effective to proceed as follows: First of all, the soluble parts are removed from the meerschaum substance ("for it is to these that the hygroscopicity of the latter is due"), which has to be effected without lessening the coherence of the remaining parts. To this end, pieces of meerschaum are treated with acids (especially hydrochloric acid) and water. In this way, a non-hygroscopic skeleton is produced which cannot properly be styled meerschaum any longer, but which possesses nearly all the qualities required for the body of a gas-ignition pill. This skeleton is kept in a wet state (not to expose it to any heat), and subsequently impregnated with a solution of nitrate of thorium or some other rare earth. When the pores are thoroughly filled with the salt, the latter is reduced into the oxide very slowly, without exposing the pill to any high temperature; and then the pills are lixiviated with hot water. The body of the pill thus prepared is next impregnated with a solution of platinum chloride, and the latter reduced into metal by heat or gases.

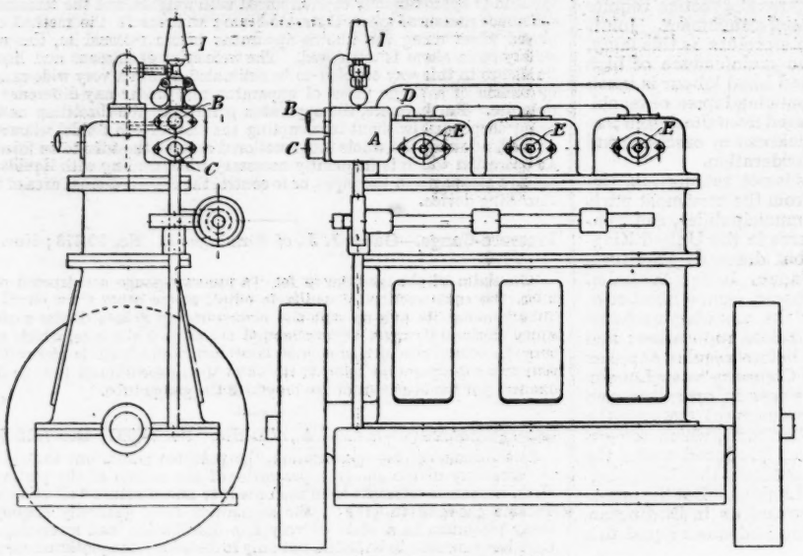
This manner of using a skeleton of meerschaum, together with platinum and thorium, for ignition pills, can only be made use of when the thorium salt is absolutely pure. If there is any impurity in it (and generally thorium nitrate, as sold by the trade, is not absolutely pure), then the pill will be spoilt. The patentee therefore suggests another method in which to make use of the combination skeleton of meerschaum, platinum salt, and thorium salt. According to this plan, the thorium is not retained in the interior of the pill, but only serves to fill the pores of the skeleton, so as to keep them in such a state that they cannot trickle during the process of manufacture, and to ensure that the platinum shall find inside the pores of the meerschaum skeleton the thorium with which it mixes. Thus, when the thorium salts are subsequently removed (which takes place as soon as the whole process of reduction is finished), platinum mohr remains inside the pores of the skeleton in a finer state than can be reached in the ordinary way of producing platinum mohr. The skeleton has to be manufactured in the same way as before, by removing

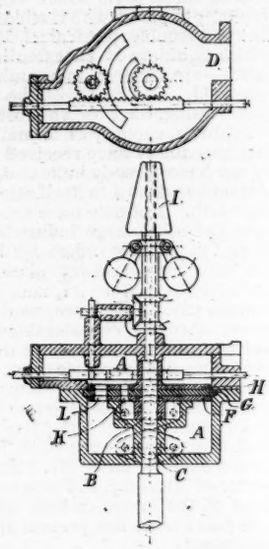
the soluble parts of the meerschaum by means of acid and water; and the wet pills are then saturated with nitrate of thorium and dried very slowly. The incorporated thorium salt will thus serve, "firstly, for the purpose of mixing with the salts of platinum, for producing the finest division of the platinum mohr inside the pill; and, secondly, as a stronghold for the finest parts of the skeleton during the whole process of manufacture, preventing them from melting, and also preventing the closure of the finest pores." As soon as the thorium has served these purposes, it is removed, before the pill is used. The dried skeleton, filled with salt of thorium, is then saturated with a solution of platinum salt; and after being slowly dried, the platinum salts inside are reduced to platinum mohr.

Internal Combustion Gas-Motors.—Crossley, W. J., of Manchester. No. 23,266; Nov. 22, 1899.

This invention is for the purpose of obtaining more regular turning with internal combustion motors, by varying the power given by successive impulses to the amount required to drive the load for the time being—"thus giving constant regulated impulses, in place of full-power impulses with some of them entirely cut out, as is usually the case with motors of this description."

Applied to an internal combustion motor having three cylinders working on the "Otto" or four-stroke cycle, with three equidistant crank-pins (thus giving three regulated impulses for every two revolutions), the arrangement is as shown in the engraving. Fig. 1 is an end view in elevation of the motor; fig. 2 is a longitudinal elevation; and fig. 3 is a horizontal and vertical section through the governing arrangement.





As applied to a three-cylinder motor, a cut-off shaft is driven by gearing so as to revolve three times for each two revolutions of the crank-shaft, which passes through an enclosed chamber A (the cut-off chamber). This chamber is provided with a gas-inlet B, an air-inlet C, and a mixture-outlet D—the latter being connected to a pipe which leads to an admission-valve E on each cylinder. The gas-inlet is in communication with the gas-port K in the cut-off plate F; and the air-inlet C is in communication with the air-port L. The cut-off plate is a thin disc having through ports K and L, placed one outside the other, and extending over some 120° of its surface, with the exception of sufficient laps or covers at the outer and inner edges, and to divide the two ports. As the cut-off plate revolves, its ports uncover two corresponding ports in a fixed plate G; one being connected intermittently to the air-inlet and the other to the gas-inlet of the cut-off chamber through the plate F. These ports also extend circumferentially some 120°; and consequently, as the cut-off plate revolves, its ports open to the gas and air ports in the fixed plate G for some 240° of the revolutions of the cut-off shaft. (This 240° of the cut-off shaft corresponds to 180° of the crank-shaft, and is made to coincide with a suction stroke of one of the pistons.) As the cut-off shaft revolves three times to two revolutions of the crank-shaft, the port-openings will thus coincide with the three suction strokes of the three pistons.

In addition to these cut-off and fixed plates, there is a governor-plate H (having similar ports through it), which may be turned round the cut-off shaft as a centre through an arc of some 120°. Its position is defined and decided by a governor I, by (say) a toothed rack and two small pinions. If the ports in this governor-plate H are opposite to the ports in the fixed plate G, the suction continues throughout the whole of a suction stroke of one of the pistons. If, however, the governor-plate is moved round a little against the direction of motion of the cut-off plate, the latter will have its ports closed before the termination of the suction stroke; and so the piston will not be able to draw in a cylinder full of mixture, but a reduced charge only—such charge, on compression and ignition, giving a reduced impulse. The extent to which the successive impulses are reduced is dependent upon the position of the governor-plate; and this position is decided by the governor I.

Mantles for Incandescent Gas-Lights.—Place, J., of Beckenham. No. 3995; March 1, 1900.

This construction of mantle for incandescent gas-lamps consists of a number of rods or filaments of the material to be rendered incandescent, to replace the woven mantle hitherto generally in use, by which means the patentee claims to be "enabled to replace damaged portions of the mantle at small cost without, as has hitherto been necessary, being obliged to replace the whole mantle."

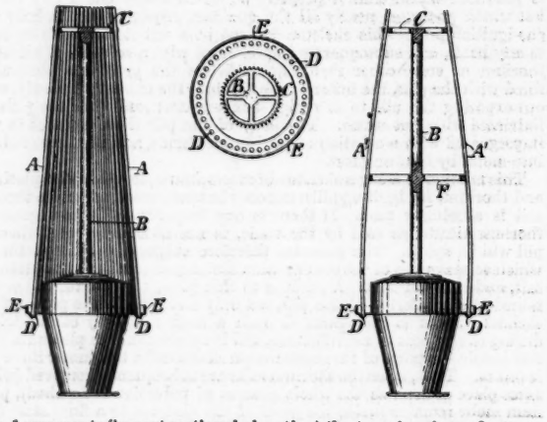


Fig. 1 represents (in part sectional elevation) the top of an incandescent burner with such a construction of mantle in position. Fig. 2 is a plan of same. Fig. 3 is a view (partly in section) of a slightly different form of mantle supported by a modified arrangement of stem.

A A^1 are rods or filaments composed of incandescent material—in the former case straight, in the latter case curved—of which the mantle is built up. B is the upright stem inserted in the centre of the burner, and carrying a wheel-like expansion C, provided round its circumference either with a number of holes or a number of more or less semicircular recesses. Around the top of the burner is arranged a ring or channel E, in which are depressions D corresponding in number to the holes or recesses in the crown, and which number again depends upon the number of filaments it is desired to employ. Where curved filaments are used, a notched or perforated ring or expansion F is secured horizontally near the middle of the rod B, so as to afford an internal and intermediate support.

To construct the mantle, a number of rods are placed nearly vertically, either by dropping them through the holes or arranging them in the recesses of the expansion C so that their lower ends each repose in the corresponding depression D in the ring or channel E. As an alternative, so as to get the shape of the mantle accommodated to the natural shape and dimensions of the flame, the filaments may be of curvilinear shape instead of straight.

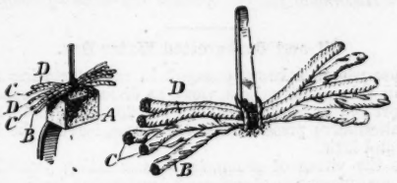
Lighters for Gases or Vapours.—Thompson, W. P.; a communication from Dr. A. Simonini, of Brooklyn, U.S.A. No. 11,874; June 30, 1900.

This invention relates to a lighter for gases, constructed as shown by the perspective view of the complete arrangement, and a similar view showing the threads or strands of which it is composed.

The invention comprises a preliminary heater of suitable form, and a secondary heater and igniter, consisting of threads or webbing or other fibrous bodies impregnated with a solution of rare earths, together with platinum chloride, or any metal of the platinum group. The percentage of the component parts varies with its use. The secondary heater has a high percentage of platinum chloride—from 10 to 25 per cent.; whereas in the case of the igniter, the percentage does not exceed 1½ per cent., and may be lower.

In carrying out the invention, a preliminary heater is made use of—such as a pill or pellet A (p. 1401)—composed of platinum black. A secondary or intermediate heater is then built up in the following manner: A thread B, having woven in it a platinum wire, is treated with a solution of thorium nitrate and platinum chloride, in proportions varying from 75 to 90 per cent. of thorium nitrate, and from 25 to 10 per cent of platinum chloride. In connection with the thread so treated, are two or more threads C, having platinum wire embodied in them, and which are impregnated with a solution of platinum chloride alone. The igniter proper is composed of two or more threads D, treated with a solution comprising (approximately) thorium nitrate 98½ per cent., cerium nitrate 1 per cent.,

and platinum chloride ½ per cent. The threads thus treated are secured to the preliminary heater A; the whole being supported by any suitable device which will hold them in the path of the issuing gas.



The operation of the lighter is as follows: The preliminary heater A glows, and transfers the glow to the thread B, which, owing to the high percentage of platinum chloride added to the rare earth, glows from end to end at a relatively low temperature—transmitting the glow in turn to the threads C, consisting of platinum wire and very porous metallic platinum. The threads C glow at a somewhat higher temperature than do the threads B. The glow from the threads C, is transmitted to, and taken up by, the threads D, which become highly incandescent and ignite the gas; and it is owing to the relatively low percentage of finely-divided platinum present in the threads that they become so highly heated. From this it will be seen, says the patentee, that there is a gradual building up or accretion of temperature from the preliminary heater through the component parts of the intermediate heater to the igniter. It is also a fact to be noted that, where a large percentage of platinum is employed, the glow travels quickly from end to end of the thread, with a low resultant temperature; while in the case of the igniter where a very small percentage of platinum is present, the temperature is high, but the glow does not travel so fast.

Washing Illuminating or like Gas.—Haddan, R.; a communication from the Berlin-Anhaltische Maschinenbau-Actien-Gesellschaft, of Berlin. No. 14,569; Aug. 14, 1900.

This invention has reference to the treatment of illuminating gas (whether obtained from coal, wood, turf, coke, or other similar material) with certain washing ingredients, so as to extract the vapoury substances, such as bisulphide of carbon, carbonic oxysulphide, oil of mustard, mercaptan, thiophene, phenol, phenates, and the like.

In order to condense the vapoury substances, and render them more easily soluble in the washing mixture, the gas is cooled down considerably, and washed with an amine preferably dissolved in alcohol—as, for instance, with an alcoholic solution of aniline. The effect of this solution is said to be to entirely desulphurize the gas. To make the aniline solution more effective, the gas is preferably dried before its entry into the solution by being led over burnt lime. The hydric sulphide separated on the combination of the carbon bisulphide with the aniline must be removed by suitable absorbents for hydric sulphide—either subsequent to the washing process, or simultaneously. In the latter case, it is effected by adding to the aniline mineral salts (preferably such as are soluble in alcohol or oil). In case the calorific and illuminating power of the treated gas should be more or less reduced, the gas, after having been washed, can be carburetted.

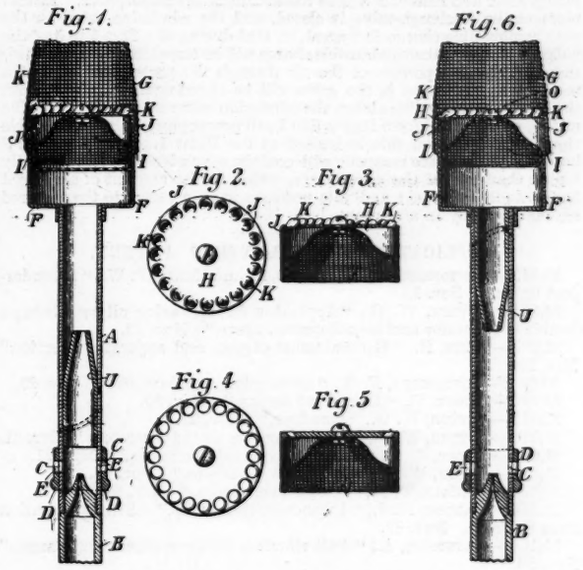
Experiments have shown, says the patentee, that traces of sulphur and rhodanide of ammonium in many cases still remain in the gas after it has been treated in accordance with the process described. In order to free the gas completely of these traces, pure sulphur in any suitable solvent is added to the amine dissolved in alcohol, oil, and the like for washing the gas; and the solution is then heated. The hydric sulphide generated by passing the gas through the solution is absorbed; and the gas is then passed through a solution of a nitrate—for instance, nitrate of potassium or of sodium—in order to free it from all traces of salts of ammonium.

Bunsen Gas-Burners.—Brooks, F. M., of New York. No. 15,682; Sept. 4, 1900.

In the introduction to his specification, the patentee says: "Investigations and experiments made by others as well as myself, since the introduction of the so-called 'mantle' of refractory material, have developed the fact that the brilliancy of the light produced by the mantle is largely dependent upon the completeness of the combustion of the fuel (combined air and gas), and that when the mixing of these two elements is complete—so that combustion is perfect, or as nearly so as possible—then, if proper devices be provided to control or direct the combined gases at the point of combustion, it is possible to produce a flame having what is now known as a hyperincandescent zone. This is a zone or part of the flame immediately above the surface of the burner, where the combustion is so complete that the heat is intense and the incandescence of the mantle more completely secured, whereby greater brilliancy and intensity in the light result than is otherwise possible, because of the presence of the intense heat which secures the great incandescence of the mantle, and partly because, owing to the complete combustion of the fuel, there is little if any residual product of combustion, which if present darkens the mantle, at its upper part first, and later the obscuration extends downwardly until its illuminating power is seriously impaired."

The present invention, therefore, relates to the parts of a burner which pertain to the above-stated features—that is to say, (1) the means for securing a proper pressure of the gas and air, and their proper mixing before they reach the point of combustion; and (2) improvements in the burner and its various parts whereby "practically perfect combustion is obtained," resulting in the hyperincandescent zone already referred to.

A in the illustrations represents the ordinary bunsen tube; B, the ordinary gas-inlet nipple; C, the air-inlets in the tube A; and D, the ordinary gate or valve which controls the admission of air. It is provided with the usual openings E, which register with the openings C in the tube. F is the enlarged upper portion of the burner tube; and G is the mantle. H is a cap. (The form shown in fig. 1 is the same as figs. 2 and 3; while figs. 4 and 5 show a slight modification.) It is composed of a hollow, cup-shaped part H; the sides I being deep enough to constitute a collar which fits with considerable snugness upon the exterior of the part F of the tube, so as to prevent any escape of gas. Around the edge of the cap (which may be arched if preferred) are formed a series of openings J made by punching holes through the metal, in such manner, however, that the severed portions K are not entirely punched out, but only about three-quarters of the way, leaving one-quarter of the metal uncut. This acts as a hinge or support for the severed portion, which is bent upwards above the plane of the surface of the cap. Thus each little part K constitutes a deflector superposed over each hole; and the tool which effects the cutting of the metal is so shaped upon its face, in conjunction with the die with which it co-operates, as to slightly twist these superposed deflectors in such manner that the gaseous mixture, as it passes upwards through the cap, will be projected in a series of jets (very slightly separated from each other) at an upward angle, and also a little

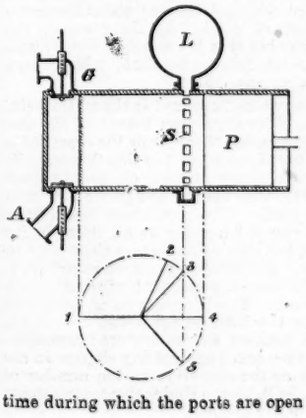


tangential to the circle of the cap at the place where they issue, so that if their line of projection were extended, the entire circle of jets would describe a figure resembling an inverted truncated cone. Because of this construction, the jets of flame, it is claimed, are controlled in volume; and each jet is practically identical in size with the neighbouring jets. Owing also to their tangential projection, they are thrown directly against the inner surface of the mantle very slightly above the surface of the burner; whereby "the most intense flame and the most perfect incandescence of the mantle" are secured "since the hyperincandescent zone which is produced by these intensely hot jets of perfectly consumed fuel, impinges directly against the inner surface of the mantle, and produces a complete circumferential illumination of it."

U is the device employed to aid in effecting the more complete mixture of the air and gas. It may be made in various forms. In fig. 1, the lower part is shown as a tube parallel to the burner-tube A, and adapted to slide within it; while above the tubular part, the side walls are drawn inwards, terminating in a contracted mouth or opening. The apparatus will, however, work well if this part be inverted, as shown in fig. 6, in which event it must be placed near the upper part of the tube A—its contracted orifice or opening being in about the same location—that is to say, within substantially the central third (vertically) of the tube A, as in the other case. When this is the arrangement, the gas and air being retarded somewhat in their upward movement by having to pass through the contracted mouth of the device U, move about and intermingle in the lower portion of the tube A; and being under pressure there, when they pass into the gradually enlarging chamber above the contracted mouth, they expand and cause "freer combustion and greater heat at the burner."

Working Two-Stroke Internal Combustion Engines with Scavenger Air Supply.—Abel, C. D.; a communication from the Gasmotoren Fabrik Deutz, of Koeln-Deutz, Germany. No. 15,797; Sept. 5, 1900.

This invention (relating to improved means and appliances for working two-stroke internal combustion engines in which the combustion gases are cleared out of the cylinder by means of scavenger air charges) is shown by the accompanying longitudinal section of the motor cylinder, attached to which is a diagram showing the action of the piston.



The motor cylinder is provided at its closed end or cylinder head with an inlet-valve G for the combustible charges—forced in under pressure; the valve being actuated for the purpose by cam or other mechanism, and the combustion gases being expelled through the valve A. The engine-piston P, during its out-stroke, uncovers the ports S that communicate with an air-reservoir L, which, before the ports are uncovered, is charged with air at a certain pressure above that of the atmosphere, and which does not receive any further supply of air while the ports are open. The degree of air pressure and the size of the reservoir are so proportioned that, for a fraction of the time during which the ports are open (say, half the time), the pressure in

the reservoir will be able to expand down to that of the atmosphere in escaping into the cylinder through the ports.

The mode of working is as follows: At the end of the piston's instroke, a combustible charge previously forced into the cylinder is ignited, and the piston is made to perform its outstroke in doing work (see Part 1 to 2 of the piston's travel). At Point 2, the discharge-valve A is opened, so that during the Part 2 to 3 of the outstroke the combustion gases under pressure escape through the valve, and when the piston arrives at Point 3 it uncovers the ports S, so that the scavenger air charge now entering from the reservoir L will drive out the remainder of the combustion gases through the valve A. At about the end of the outstroke (Point 4), the air pressure in L will have expanded fully; so that the air pressures in the cylinder and reservoir will be about that of the atmosphere. At this moment the discharge-valve is closed, and the admission-valve for the next combustible charge is opened, so that during the Part 4 to 5 of the piston's instroke, the combustible charge will be forced in under pressure, thereby driving a portion of the air through the ports S back into the reservoir L. At Point 5, the ports will be closed again; and at about the same time, or a little later, the admission-valve is also closed. The piston, on its travel from Points 5 to 1 will now compress the combustible charge admitted, and this is ignited at the Point 1. After the ports S have been closed, the reservoir will contain air under a pressure slightly higher than that of the atmosphere, owing to the amount of air forced back into it, as stated; and this pressure is then raised to the required higher degree by an air-pump.

APPLICATIONS FOR LETTERS PATENT.

20,849.—Schroeder, F. W., Peters, J., and Moran, P. W., "Incandescent lights." Nov. 19.

20,854.—Potter, W. G., "Apparatus for producing oil gas; being a combined generator and incandescent burner." Nov. 19.

20,893.—Holm, H., "Carbonization of peat, and apparatus therefor." Nov. 19.

20,947.—Gustafsson, K. G., "Generating acetylene gas." Nov. 20.

20,983.—Moore, F., "Coin-freed meters." Nov. 20.

21,015.—Potter, W. G., "Gas-fires." Nov. 21.

21,016.—Potter, W. G., "Portable coal or oil gas generators." Nov. 21.

21,054.—Wiles, S. F., "Internal combustion engines." Nov. 21.

21,074.—Knopf, W., "Incandescent gas-lamps." Nov. 21.

21,132.—Murray, T. R., "Endless conveyors." Nov. 22.

21,156.—Haddan, H. J., "Incandescent burners." A communication from C. Paris. Nov. 22.

21,165.—Crowther, A., "Anti-vibrators for incandescent gas-lamps." Nov. 23.

21,182.—Hawkes, M. F., "Gas-pendants and the like." Nov. 23.

21,214.—Vulitch, D. de, and d'Orlowsky, J., "Production of calcium carbide." Nov. 23.

21,238.—Aston, W. H., "Conveyors or elevators." Nov. 23.

21,274.—Timings, S., "Atmospheric gas-burners." Nov. 24.

21,284.—Whitelow, E. T., and Ehmann, C. P., "Gas-fires." Nov. 24.

21,295.—Harvey, E. C., "Gas heating and lighting appliances." Nov. 24.

Launceston Town Council and the Gas Company.—The differences which arose between the Launceston Corporation and the Gas Company respecting the lighting of the town have been amicably adjusted. At the last meeting of the Town Council, the contract about which there had been so much discussion was at length sealed. In answer to a question, the Surveyor said he had made inquiries with reference to incandescent oil lighting, which had been suggested as a substitute for gas lighting. He found that lighting on this principle was very expensive, and that in the town where it was adopted it was confined to a small area, and was not used in the out-districts. Mr. Trood hoped that early attention would be given to the lighting; for unless something was done, they would find the same questions cropping up again next year. He understood that a company had offered to prepare a report on the lighting of the town. The Mayor (Dr. Andrew) said the Lighting Committee would not lose sight of the subject, and they would be glad to receive suggestions from outsiders.

Fatal Gas Suffocation Case at Hull.—Gas poisoning was the immediate cause of the death of John Brough, of Egginton Street, Hull, last Saturday week; but heavy drinking appears to have been at the bottom of the act which had this lamentable result. The deceased had a private income, and lived in a house of his own. A friend (Thomas Carr) visited the dwelling on the night of the day mentioned, and found the door barred. Knowing that Brough had been drinking liberally lately, he feared something was wrong; and with a police sergeant, he forced an entrance into the house, which was found full of gas. On being cleared, Brough was found dead near his bed, and the lead piping attached to the gas-meter was discovered torn away. In the middle of the day, a police sergeant had seen deceased moving about the house suffering apparently from the effects of drink. At the inquest, the medical testimony was that gas poisoning was the cause of death; and the Jury returned a verdict of "Death from suffocation, without any evidence to show how such suffocation came about."

The Wolverhampton Gas Company's Stokers and Inclined Retorts.—A meeting of the members of the Wolverhampton branch of the Gas Workers' Union was held a few days ago, in order to hear the report of a deputation which had waited upon the Directors of the Gas Company in reference to a rise of wages and alteration of work on the inclined retorts at their Stafford Road station. The matter had previously been discussed by the men (see *ante*, p. 1043). The result was stated to be that the Directors would grant a rise of 3d. a day to all retort-house men on the old and the new work, but they could not see their way to making any alteration in the work. Purifiers' wages were raised 4d. a day, and coal unloaders and coke loaders 2d. per day; horse drivers and general labourers to remain as they are. The Directors pointed out that in future the number of retorts in the inclined plant would be eight, instead of nine as at present; thus making the work more favourable. The men were disappointed that they could not get any change in the work; but as the Company are making the alteration in the number of retorts in each bed, the labour will be lighter. Under these conditions, the men decided to accept the offer made to them.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Oil and Carburetted Water Gas.

Sir,—Those whom I know, engaged in manufacturing carburetted water gas in this country, hold views so diametrically opposed to the opinions expressed in your editorial of the 20th ult., that I am induced to offer an alternative presentment of the case, leaving the issue to the side of fact and logic.

You have the virtue of generosity in associating yourself with the "deluded" manufacturers of carburetted water gas; for surely not one of these gentlemen could ascribe his adoption of the process to the warmth of its advocacy in your columns. You speak now of having "welcomed the advent of carburetted water-gas manufacture into the United Kingdom;" but your past efforts have seemed to many of us more in the way of speeding the parting than of welcoming the coming guest.

> "Perhaps it was right to dissemble your love,
> But—why did you kick me down stairs?"

And is there not something (I had almost said) indecent in your present eagerness to proclaim the obituary, and superintend the obsequies of the industry? If it be mine to express the knowledge and faith that is in me, I hope to show that the prospect of carburetted water gas in the United Kingdom was never more auspicious than now.

You cite Mr. Trewby's fine address of 1891 as if his early experience of carburetted water gas were more rosy than subsequent events justified; but the Beckton results given in the 1892 paper of Messrs. Goulden and Paddon leave no room for such inference. With an oil costing 3¼d. in the service-tanks, they were then obtaining 900 candle-feet per gallon. The improved character of the oils and plant now supplied in this market have increased this yield by an average of over 60 per cent.—thus preserving the early economic condition, although oil were at a present price of 5½d. per gallon, and the process had formerly to compete with abnormally cheap gas coal. Later, when my firm was engaged in the construction of various plants throughout the country, you propounded your "poser" for "English dabblers in water gas" with "fluid hydrocarbon costing anything from 3½d. to 5d. per gallon." No one was then misled by delusive oil prices; but, since the very conditions which gave birth to the process were condemned by you as prohibitive, are you now the authority to fix the date of its decease?

The price of oil being the main point at issue, I will briefly recall (from memory) the past market of that commodity. A gradual decline in the price of gas oil (then exclusively Russian) was deranged in 1895 by a fierce commercial contest for the refined oil trade of the United Kingdom, suspending all arrangements for the independent storage and transport of gas oil, and substituting refined kerosene (still Russian) for gas-making purposes, at a price 30 per cent. below that previously attained by gas oil. No one "fell into the delusion that this effect was traceable to the ordinary operations of the economic law of supply and demand," and no one hesitated to profit by the artificial prices from disinclination to support unnatural causes. After eighteen months of this "oil-war," matters were patched up, and Russian gas oil was gradually restored to the market at about 3¼d. per gallon.

The next movement was in the spring of 1897, when the Standard Oil Company (upon the representations of my firm) offered their surplus stocks in this market. The sudden advent of this new factor at once broke the market; and a large quantity of oil was sold at 2d. per gallon. The depletion of this American surplus was unhappily coincident with the beginning of a phenomenal condition of world-wide industry and militant activity, which, following a period of equally phenomenal depression, rapidly enhanced and exhausted market commodities. Atlantic tank transport reached 32s. 6d. per ton, having been previously as low as 9s. 6d. The difference between these extremes represents over 1d. per gallon of oil, whereas 0·6d. per gallon is reckoned a fair normal charge for transatlantic carriage. But the difficulty in the oil situation was due mainly to the fact that the startling increase in the demand for oil overtook the quick resources of the Standard Oil Company, and created a panic in the management. They temporarily forsook their character of "territorial octopus," and discouraged the sale of petroleum and its products throughout their system.

Now, however, that West Virginia has been opened with an abundance which is said to rival the Pennsylvania fields, the recent high prices may prove a disguised blessing, inasmuch as they have given a tremendous incentive to oil exploitation throughout the world, and have induced the Americans to eliminate the uncertain question of Atlantic transport by constructing ocean tankage sufficient to carry their gas-oil trade, and give them complete control of their freights. This will not be in commission for another twelve months.

I estimate that the average price of gas oil, *ex* tank-steamer, from the introduction of carburetted water-gas manufacture to the present day, is 3d. per gallon; and, within the limits of human foresight, there is no reason to suppose it will exceed this price in the future. Personally, I am satisfied that the future price will be substantially less than that figure. At the present moment, future supplies of the best quality of gas oil can be booked at less than 3½d. per gallon; but I do not advise purchase. The conditions now prevailing in America are not yet sufficiently reflected in this market, nor is this the season for purchasing. The market quotation for crude Pennsylvania oil is now $1·07 per barrel, and still declining; whereas, during the four months of last winter, the price per barrel averaged $1.67. One dollar per barrel may be taken as the fair normal value in the past.

A reduction of 36 per cent. in the price of crude oil, and a greater assured reduction in the future cost of transportation, are the conditions which usher in the New Year. When this is connected with the fact that the extensions of the process undertaken during 1900 aggregate a capacity of over 40 million cubic feet daily, being 50 per cent. greater than the extensions of 1899 (the next largest year, both being years of maximum oil prices), is carburetted water gas moribund in the United Kingdom? or is it revolutionizing the state of the gas industry? And I may add that in Continental countries, where the gas distributed is not only of low candle-power, but where customs duties are levied on petroleum, the

auxiliary advantages of carburetted water gas are meeting increasing recognition.

I now come to a view of this question before which the points I have made shrink to secondary significance. It concerns capital charges. I need not detain you long in this connection, because what I would say is embodied in a paper, entitled "Carburetted Water Gas as a Coal Gas Auxiliary," which I read last year before the American Gaslight Association.* I enclose a copy. You will see that I have resolved the output of a large English town into two portions. One comprises two-thirds of the maximum and 83·7 per cent. of the annual output, and is taken as a fixed coal gas portion. The other, comprising one-third of the maximum and 16·3 per cent. of the annual output, is called the "debatable" portion, and its cost per thousand is reckoned for both carburetted water gas and coal gas, including capital charges, maintenance, and depreciation. For the cost of money is as real an element in the price of gas as coal, oil, or any other "raw material," and should be as accurately weighed and compared. Under the conditions described in the paper, it was found that the ultimate costs were equivalent for this debatable portion, when the manufacturing cost (*i.e.*, the ultimate cost, less capital charges, maintenance, and depreciation) of carburetted water gas was 2½ times that of coal gas alone!

Your remaining point is that you can still find a works in the United Kingdom, conducted with the wisdom which characterizes the management of the South Metropolitan Gas Company, which is not engaged in the auxiliary manufacture of carburetted water gas. I may, therefore, point out that, although the South Metropolitan Company does not make carburetted water gas, it shares, equally with those who produce this gas, some of the important collateral benefits of the process—namely: There will be used this year in the United Kingdom over 150,000 tons of gas oil, displacing 1,600,000 tons of coal and 1,000,000 tons of coke. This is largely confined to the winter season, and represents one-half of the total annual consumption of coal and cannel by the three Metropolitan Companies. I will not attempt to picture what would result if the present coal and coke markets were burdened with these additional requirements and supplies, nor will I more than name the fact that the labour market is proportionately affected.

A. G. Glasgow.

Westminster Chambers, 9, Victoria Street, London, S.W., Dec. 3, 1900.

P.S.—Absence from England prevented my replying in your previous issue.

The Minimizing of Sunday Labour on Gas-Works.

Sir,—There is one point in Mr. Shadbolt's excellent paper on the above subject at the meeting of the Manchester District Institution to which I should like, with your permission, to draw attention—viz., the question of the stokers' wages for the Sunday or seventh day. From the paper, I gather that at Grantham the stokers are not paid for the Sunday they are off. If they are, then Mr. Shadbolt ought to have added the cost in Column 3 of Statement A. In the discussion arising out of the reading of the paper, the only person who referred to this matter was Mr. Tim Duxbury, who, in speaking of the regularity of the workmen, said "they had lost one shift in the week, and took good care not to lose another." From this I infer that at Middleton the men lose their Sunday's pay. If my inferences are not correct, then the cost per ton of coal carbonized greatly exceeds 3·45d., as stated by Mr. Shadbolt.

Something over twelve months ago, the Directors of the Company I serve resolved to give the stokers their Sundays off; and when I was appointed, they told me their desire was that, as far as possible, Sunday labour was to be stopped. I had no difficulty in falling in with their views, as I am strongly in favour of Sunday closing. But in making comparison with the carbonizing wages formerly paid and those of the present day, I was impressed with the cost of Sunday closing, as we pay the men for their Sunday off. It works out as follows:—

No. of Shifts.	Coals Carbonized per Shift. Tons.	Total Coals Carbonized. Tons.	Wages per Week.	Cost per Ton Carbonized.
7	2¼	15¾	35s.	2s. 2·66d.
6	2¼	13½	35s.	2s. 7·11d.

These figures show an increase of 4·45d. for wages alone; and this added to 3·45d. as per Mr. Shadbolt's statement, makes 7·9d. per ton, which is quite another figure altogether, and is slightly under what it costs in Guildford.

Nov. 28, 1900. Geo. R. Love.

The Sale of Stock to Gas Consumers.

Sir,—Recent sales of gas stocks by auction or tender have generally been, to a considerable extent, failures. Stocks, paying at the present price of gas as much as 5 per cent., or even more, to the investor, have, both in London and elsewhere, failed to find purchasers in sufficient numbers—a large proportion of the stock offered being in almost all cases unsold. I have not heard whether the unsold portions have been taken by the existing shareholders, to whom by law these have to be offered at the reserve price. I expect such to be the case, because, being offered at a fixed price, the ordinary investor knows exactly what he or she is buying; but when tendering many do not understand, and this slight difficulty is sufficient to cause such persons to let the opportunity slip.

Why gas directors do not endeavour to place all new issues of stock with their consumers is an enigma. But possibly the present difficulty of selling by auction or tender may lead them to entertain this useful alternative. Quite lately the South Metropolitan and the Crystal Palace District Gas Companies successfully issued £120,000 and £20,000 of new stock respectively. Both Companies are under the auction clauses, which require all new stock to be offered to the public by auction or tender. These Companies chose the latter alternative, and advertised according to law, and only according to the letter of the law, for tenders. No tenders were wanted, and none were received. The Directors were then free to offer the whole of these issues of stock to their shareholders, their consumers, and their employees. Seeing that all such issues are at the market price, as near as may be, they are of no advantage to the shareholders; but it is a great advantage to a gas company to have as many consumers as possible among its shareholders. Consequently, after reserving sufficient to supply the wants of the employees (who under the profit-sharing system require a considerable amount), the balance was offered to the consumers at the reserve price.

In the case of the South Metropolitan Company the reserve price gave £4 2s. per cent., and that of the Crystal Palace District Gas Company £4 9s. 3d. per cent., on the investment. In both cases, circulars were sent to every consumer, giving the price at which £5, £10, £20, £50, and £100 of stock could be purchased; and it was stated that the applications for small amounts would have preferential consideration. The whole was much more than applied for in both cases; and the smaller Company had to make the maximum allotment £100 of stock, while with the larger Company it was £500.

The £18,000 (odd) of the Crystal Palace District Company was distributed among 300 applicants, or about £60 apiece on the average. Some 800 consumers of the South Metropolitan Company took the balance of about £100,000 of the stock, or an average of about £120 per applicant. It is clear that the stock would have been all taken at higher prices than those at which it was issued; but in both cases it was fixed higher than was advised by experts. The money was badly needed; and the Directors fixed the prices lower than they otherwise would have done for that reason.

Gas companies intending to apply to Parliament next session are now preparing their Bills. Would it not, therefore, be advisable to insert provisions for the direct issue of new stock to consumers at the market price of the day, without first offering it to the public by tender. In 1895, the South Metropolitan Company failed in such an attempt; but within the past twelve months both the Government in their War Loan and the London County Council have seen the wisdom, and proved the advantage, of issuing their loans at a fixed price. With such precedents, gas companies should have a good chance of success.

The only difficulty is the method of determining what is the market price. Of course, a slight margin must be permitted; but this could be limited in the Act at (say) not exceeding so much per cent. below the average market price of the last month. For the last ten years we have placed practically all our new stock with the consumers after supplying the employees. We did so before we obtained parliamentary authority; and I can say that the system has great and obvious advantages, and no disadvantages whatever.

George Livesey.

South Metropolitan Gas Company, Dec. 1, 1900.

Gas-Fires in Living-Rooms.

Sir,—It may be useful to have the actual figures as to heating rooms so as to know exactly what is possible in practice.

A flueless stove, such as a condenser, burning 15 cubic feet of gas per hour, night and day, in a room 14 feet by 14 feet by 10 feet, with limited but sufficient ventilation for ordinary use, would maintain a rise of 30° over the outside temperature, but would take several hours at first to approach this, as the walls would have to be raised to the temperature before the heat could be maintained. And here is one of the practical difficulties—the necessity for heating the room some hours before it is wanted—which can only be overcome by a fire or stove largely in excess of the ordinary power required. If a warm-air stove is used with a flue, and controlled ventilation, a rise of 22° to 24° may be obtained; but if the fire is used in the day only, this will not be reached until late in the day.

As a matter of practice, a room 14 feet square and 10 feet high does not require an average of more than about 60 cubic feet per day of twelve hours, or 5 cubic feet per hour, for the six months of winter, if the fire is attended to, only lighted when required, and no waste or over-heating allowed. This was my own average in my town house, calculating for the different sizes of the rooms, for eight or nine years; and yet there were times when a 30 cubic feet consumption in a room 16 feet square was barely enough. It is difficult to decide between two points, whether to have a small fire with limited consumption, which will certainly be unsatisfactory in very severe weather, or to have a larger one, and turn it down to what is required. The latter is the most comfortable, and it costs no more if attended to; but there is possibility of waste in any case, and gas-fires should be under the control and supervision of the person who has to pay the bill.

There is one point in the figures obtained in practice worthy of notice. They do not work out to the theoretical requirements—being much lower; and this difference is caused by the heat evolved by gas used for lighting, and also that from the persons in the room. A room in constant use is always warmer than one which is not—a fact very well known, although the reason has usually been overlooked.

There is no doubt that the temperature of a room has comparatively little to do with its feeling of warmth or the reverse. A moist atmosphere always feels much colder than a dry one; and for this reason a warm-air stove, which removes the surplus moisture in damp weather, makes a room feel warmer than would be expected from the temperature registered by a thermometer.

For this reason an incandescent fire with an arrangement for warming the air, is by far the cheapest method of heating; and with proper ventilation and an absence of down-draught in the flue, a room can be kept comfortable—as fresh and sweet as with an open coal-fire—with little greater cost than coal.

The oppressive feeling sometimes complained about when gas-fires are used, is caused entirely by down-draught in the chimney, or by an escape of the products of combustion into the room; and for this reason flueless stoves, even when designed specially for use without a flue, must never be fixed in living rooms, or in any place where the ceilings are low.

The most expensive room I have had to deal with as regards gas heating, was one with three outside walls, 21 feet square, and 17 ft. 6 in. high, and with very large windows. Using an incandescent fire with a large warm-air arrangement, the average annual gas consumption was 50,000 cubic feet, which, at 4s. per 1000, cost £10 yearly.

Thos. Fletcher.

Warrington, Dec. 1, 1900.

* This paper was given in full in the "Journal" for Nov. 28, 1899 (p. 1311).—Ed.J.G.L.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1901) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

The following notices have been given in addition to those which appeared last week:—

Arlesey Gas.—Authority will be sought for the incorporation of a Company to supply gas to Arlesey, Stotfold, Henlow, and Clifton, in Bedfordshire, and also to sell gas in bulk. The usual powers will be sought; and in the Bill to be promoted, provision will be made for obtaining sanction to produce and supply electricity. Power to raise the necessary capital will be required.

Barrow Corporation.—The Barrow Corporation will apply for power to construct additional works, comprising two reservoirs, a weir, a settling-pond, and a conduit or pipe-line, and to take water from the River Duddon and other streams. In the Bill to be promoted, provision will be made for securing the purity of the water at the source of supply, altering the existing rents, rates, and charges, laying down gas and water mains, and lighting private streets and courts; also for determining purchase-money and compensation. More capital will be required.

Blackburn Corporation.—In a General Bill to be promoted by the Corporation, power will be sought to extend the boundaries of the borough, and to supply electricity within the gas and water limits. Authority to raise more money will be applied for.

Broadstairs Water.—The Urban District Council of Broadstairs and St. Peter's will apply for authority to acquire the undertaking of the Broadstairs Water Company, maintain and improve the existing works, and construct new ones. Provision will be made for the supply of water in the ordinary way and in bulk, and regulations framed for the prevention of waste. Borrowing powers will be required.

Burgess Hill Water.—The Burgess Hill Water Company will apply for power to construct new works, consisting of an adit and service reservoir in the parish of Ditchling. Special provisions will be made in regard to the supply of water and fittings, injury to pipes, meters, and fittings, &c. Additional capital will be needed.

Bury Corporation.—Notice has been given by the Corporation of their intention to apply for authority to purchase certain lands, among them being an area of 2 roods 5 poles 8½ yards, in the parish of Bury, for the extension of their gas-works. Borrowing powers will be sought.

Cromer Water.—The Cromer Water Company will apply to be dissolved and re-incorporated with additional powers, and an extension of limits so as to include a number of adjacent parishes. Provision will be made for the sale of water in bulk and the prevention of waste. New works are contemplated, comprising a pumping-station, a service reservoir, and two pipe-lines.

Derby Corporation.—In a General Bill to be promoted by the Corporation, power will be sought to supply electric energy and construct additional water-works, consisting of four filter tunnels. Provision will be made for protecting the water from becoming contaminated. More money will necessarily be required.

Dorking Urban District Council Water.—Application will be made by the Council for authority to purchase the undertaking of the Dorking Water Company, and maintain and improve the existing works; also to enter into an agreement with the Dorking Rural District Council for the transfer to them of a portion of the concern lying within their district, and to appoint a Joint Committee of the two bodies. Money powers will be sought.

Dover Corporation.—Application will be made by the Dover Corporation for authority to purchase the undertakings of the Dover Gas and Electricity Supply Companies, and maintain, improve, and extend all or some of the existing works; also to supply gas and electricity for light and power, as well as meters and fittings. Permission will be sought to levy rents, rates, and charges, and to raise money for carrying out the scheme.

Harpenden Gas.—The Harpenden Gas Company will seek dissolution and re-incorporation, with power to maintain and continue the existing works and construct new ones. The limits of supply are to be defined. Authority will be sought to levy rates and charges, sell gas in bulk, inspect meters and supervise fittings, &c.; and also to apply for a Licence or Provisional Order under the Electric Lighting Acts.

Harrogate Water.—The Corporation of Harrogate will apply for authority to carry out certain works, consisting of a reservoir to be situated on a tributary of the River Burn, four aqueducts, and filter-beds, and to appropriate waters. Borrowing powers will be sought.

Heckmondwike Gas.—A proposal will be submitted to Parliament for the constitution of a Joint Gas Board, consisting of representatives of the Urban District Councils of Heckmondwike and Liversedge, for the purpose of acquiring the undertaking of the Heckmondwike Gas Company. The present works are to be maintained, improved, and extended. Provision will be made for the borrowing of money, the application of revenue and profits, the making good of any deficiency, and the raising of contributions by the constituent Authorities. The District Councils will ask to be invested with all the necessary powers for the manufacture, production, storage, and supply of gas of any description, for all domestic, trading, public, and other purposes.

Honley Urban District Council (Gas Transfer).—Application will be made by the Honley Urban District Council for authority to purchase the undertaking of the Honley Gas Company, Limited, by agreement, and carry it on with the usual powers granted to suppliers of gas. Permission will be sought to raise more money.

Horley District Gas.—The Horley District Gas Company will apply to be dissolved and re-incorporated with power to maintain the existing works, construct new ones, and supply gas within the limits defined by their Order of 1886. The present capital powers are to be regulated, and more money will be required.

Ilkeston and Heanor Water Board.—Application will be made by the Ilkeston Corporation and the Heanor District Council for sanction to the constitution of a Joint Water Board to acquire the undertaking of the Meerbrook Sough Company, construct water-works, and supply water in Ilkeston, Heanor, and elsewhere. The usual powers conferred upon owners of water-works will be sought.

Kettering Urban District Council Water.—The Urban District Council of Kettering intend applying for power to construct a number of new works, comprising a reservoir in the parishes of Rothwell and Orton, another in the parishes of Rothwell, Orton, and Thorpe Malsor, six conduits or pipe-lines, and two outlet tunnels. It is proposed to take the waters of the Slade stream and its tributaries, and the stream flowing between Loddington and Orton and its tributaries. Provision will be made for the protection of land, mine, and mill owners, for preserving intended gathering-grounds and sources from pollution, for protecting the works, and for the supply of water to other Authorities, bodies, and persons. Money powers will be sought.

Kingston-upon-Hull Corporation.—In a General Bill to be promoted by the Corporation, power will be sought to acquire land for the protection of waters and water-works, and make provision for the supply of water and the prevention of its pollution. Some more money will be required.

Leatherhead Gas.—Application will be made by the Leatherhead Gas Company to be dissolved and re-incorporated with power to maintain the existing works and supply gas, stoves, fittings, residual products, &c., in Leatherhead and adjacent parishes. In the Bill to be promoted, provision will be made in regard to regulating the price of gas by a sliding-scale or otherwise, and also as to the quality and pressure and the inspection of fittings, &c.

Llandrindod Wells Water.—The Urban District Council of Llandrindod Wells will seek power to acquire the undertaking of the Llandrindod Wells Water Company, maintain the present works, and construct others, consisting of two reservoirs and pipe-lines, and supply water in their district and the parishes of Cefnllys Rural and Llandrindod Rural, in Radnor. Further provisions and regulations will be made in regard to the supply of water, the levying of rates and charges, and the borrowing of money.

Long Eaton Gas.—The Long Eaton Gas Company will apply for dissolution and re-incorporation with additional powers of supply in the town and neighbourhood. The present works are to be maintained and enlarged. In the Bill to be promoted, the usual provisions will be made in regard to the price and quality of gas, the supply of meters, fittings, &c., and the supervision of the latter.

Mansfield Corporation.—The Corporation notify their intention of applying for power to purchase the undertaking of the Mansfield Woodhouse Gas Company. It is proposed to acquire lands for the manufacture of gas, and make general provisions as to its sale in the ordinary way and in bulk, and the supply and inspection of meters and fittings. Additional powers will be sought in respect of the water-works. Certain parts of the Mansfield Water Act, 1870, and of the Mansfield Commissioners' Gas Act, 1878, are to be repealed. The Corporation will also seek authority to construct an electricity generating station, in conjunction with a refuse destructor, supply electric energy in their district, and make agreements with local authorities and companies in relation thereto. Permission will be asked to exclude the water and electrical loans from the operation of the Public Health Act, 1875. Further borrowing powers will be sought.

Margate Corporation.—Application will be made by the Margate Corporation for power to construct a series of works, comprising a pumping-station at Wingham, and the necessary adits and conduits or pipe-lines. Provision will be made for the acquisition of lands, waters, and easements, as well as for securing the purity of the water. It is proposed to ask for the partial repeal of certain powers of supply within the area of the Corporation now possessed by the Canterbury, East Kent, and Mid-Kent Water Companies. More money will be needed.

Mond Gas.—This is one of the most important projects to be brought before Parliament next year; and it will be found fully dealt with under the heading of "Miscellaneous News," (p. 1409.)

Oakham Water.—Application will be made for the incorporation of a Company for the construction of works and the supply of water in Oakham and other parishes in the county of Rutland. The works will comprise a well, adits, an aqueduct, and a pumping-station in Braunston, a reservoir in the parish of Oakham, and aqueducts leading to the town. The usual powers granted to suppliers of water will be sought.

Omagh Gas.—The Omagh Gas Company will apply to be dissolved and re-incorporated with power to supply gas within so much of the township and urban district of Omagh, and the parishes of Drumragh and Cappagh, in the county of Tyrone, as is situate within a distance of 2½ miles from the centre of the existing works. Additional land will be required. Provision will be made for a sliding-scale of price and dividend. The Company will also seek power to supply electricity, or to apply for it under the Electric Lighting Acts.

Oswaldtwistle Improvement.—In a General Bill to be promoted by the Oswaldtwistle District Council, provisions will be included for the maintenance and improvement of the existing water-works, the acquisition of lands, and the prevention of the pollution of water. Borrowing powers will be sought.

Prestatyn Water.—The Urban District Council of Prestatyn will apply for authority to acquire the undertaking of the Dyserth, Meliden, and Prestatyn Water Company, continue the existing works, and construct others, comprising a storage reservoir in the parish of Cwm, two aqueducts, and a balancing-tank in the parish of Dyserth. Power to sell water beyond the limits of supply, and also in bulk, will be sought. Provision will be made for the protection of the works and the prevention of pollution, as well as for the borrowing of money.

Rhyl Improvement.—Application will be made by the Rhyl District Council for power to construct water-works, consisting of a reservoir on the Dolwen and an aqueduct connecting it with the existing Plasuchaf reservoir. Authority will be sought to appropriate waters and prevent their pollution; also to supply sea water. Power to raise money and levy rates and charges will be applied for.

Ripon Corporation.—Application will be made by the Ripon Corporation for power to construct new works, consisting of six pipe-lines, divert and appropriate additional water, and make provision for the preservation of the sources from pollution. Authority will be sought for the sale of water in bulk, and for raising more money.

Rugby Water and Improvement.—Application will be made by the Rugby District Council for authority to construct new water-works,

comprising a reservoir and two pipe-lines, with an incidental alteration of a main road. The Bill to be promoted will contain provisions with regard to the acquisition of land, the interference with streams, and the prevention of contamination of the water. Section 25 of the Rugby Water-Works Act, 1863, is to be repealed, and existing agreements with millowners are to be varied. Powers are also required to supply electricity to adjoining districts, and also electric fittings, as well as to make bye-laws in relation thereto.

Shipley Gas.—The Shipley District Council will ask for power to purchase the undertaking of the Shipley Gas Company by agreement, maintain and improve the existing works, and supply gas within and beyond the present limits. Further provision will be made with regard to the water undertaking of the Council (particularly as to the prevention of pollution of the water), and also in respect of electric lighting. Authority to borrow money will be required.

Smethwick Corporation.—Among the general provisions of a Bill to be promoted by the Smethwick Corporation will be some relating to the supply of electricity outside the borough, and also electrical fittings, and to the laying of gas-mains, &c., in undedicated streets.

Stratton and Bude Gas.—Application will be made for the incorporation of a Company to construct works and supply gas in the parishes of Stratton, Poughill, and Marhamchurch, in Cornwall. The usual powers granted to owners of gas undertakings will be sought.

Swanage Gas and Water.—Powers of incorporation will be sought for a Company to supply gas in the parishes of Swanage, Langton Matravers, and Studland, and water in the two first-named places, all in Dorsetshire. The existing gas and water works are to be maintained and new ones constructed. The undertakings authorized by the Swanage Gas and Water Order, 1883, and the Swanage Water Act, 1884, are to be transferred to the new Company.

Wells Corporation Water.—Application will be made by the Wells Corporation for power to purchase the undertaking of the Wells Water Company, maintain the existing works, and construct others, consisting of a storage reservoir, an aqueduct, and two pipe-lines. It is proposed to extend the limits of supply so as to include the parish of Wookey. Borrowing powers will be required.

Wells Water.—The Wells Water Company will apply to be dissolved and re-incorporated with power to maintain and enlarge their present works by the construction of three reservoirs and a like number of aqueducts. Authority will be sought for the supply of water in bulk and by meter; and provision will be made for the prevention of pollution and waste. The capital of the new Company will be defined.

NOTICES OF APPLICATIONS TO THE SECRETARY FOR SCOTLAND FOR PROVISIONAL ORDERS UNDER THE PRIVATE LEGISLATION PROCEDURE (SCOTLAND) ACT, 1899.

The following additional notices of applications under the above-name Act have been published:—

Ardrossan Gas and Water.—The Corporation of Ardrossan intend to apply for power to construct new gas-works, and to supply gas therefrom to the burgh and adjacent places and parishes. It is proposed to sell the existing works. The limits of supply are to be extended and defined. Authority will be sought to construct water-works, comprising a reservoir near Burbie Muir, a catchwater in the parish of West Kilbride, conduits, and other works. Provision will be made for diverting and appropriating water and preventing fouling and waste. Borrowing powers will be sought.

Glasgow Corporation.—In a Tramways and General Order to be applied for by the Corporation of Glasgow, provision will be made for the establishment of friendly societies and superannuation and other funds in connection with the gas undertaking, and the reduction of the illuminating power of the gas. To carry out the latter object, the Corporation will ask for the repeal of section 55 of the Glasgow Corporation Gas Act, 1869, and section 4 of the Act of 1882.

Grangemouth Water.—The Corporation of Grangemouth will seek authority to construct additional water-works, comprising three conduits or pipe-lines, and make provisions for the prevention of waste. Further borrowing powers will be required.

Hamilton Burgh.—Application will be made by the Corporation of Hamilton for the amendment of the Hamilton Water-Works Act, 1854, and for new powers in regard to the rating and valuation of certain classes of property.

Stirling Corporation.—The Stirling Corporation intend to apply for certain incidental powers in connection with electric lighting, and also for the equalization of rates within the borough and the repeal of the differential water-rate. Authority will be sought for the revival of the powers of the Water Commissioners for the acquisition of lands and the construction of a conduit, as well as for the extension of the water limits. More money will be required.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1901).

Under the Gas and Water Works Facilities Act, 1870.

Bearsted Water.—Application will be made to authorize certain parties or a company formed for the purpose, to make, maintain, and enlarge water-works, comprising a pumping-station in the parish of Bearsted, two service reservoirs in the same parish, and the necessary conduits or pipe-lines. The area of supply is to include the parishes of Bearsted, Hollingbourn, Thurnham, and Leeds, in Kent; and the usual powers granted to owners of water undertakings will be applied for.

Bexhill Water and Gas.—The Bexhill Water and Gas Company will seek authority to raise more capital, and acquire by agreement additional lands, water rights, and easements.

Caterham and District Gas.—The Caterham and District Gas Company will apply for power to acquire land and construct additional works.

Dearne Valley Water.—The Dearne Valley Water Company will apply for power to raise more capital.

Frimley and Farnborough District Water.—Application will be made by the Frimley and Farnborough District Water Company for authority to raise more capital, and to purchase and hold for the purposes of their undertaking certain lands in addition to those which they have now power to acquire. The Company's Act of 1893 and the Wey Valley, Frimley, and Farnham Water Act of 1898 are to be amended so far as may be necessary.

Henley-on-Thames Water.—The Henley-on-Thames Water Company will apply for an extension of their limits of supply so as to include the whole of the existing borough of Henley, the parish of Badgemore, and so much of the parish of Rotherfield Greys as lies within certain specified boundaries. Additional capital will be required.

High Wycombe Gas.—The High Wycombe Gas Company will apply for an extension of their limits so as to include the parish of Hughenden, in Buckinghamshire, and for power to raise more capital.

Hungerford Water.—Application will be made by certain parties resident in Hungerford and elsewhere for authority to supply water in that parish and several other places, construct works, and generally carry on the business of a water undertaking. Capital and borrowing powers will be sought.

Mid-Kent Water.—The Mid-Kent Water Company intend to apply for power to extend their limits of supply so as to include the parishes of Ash, Longfield, Hartley, Ridley, Kingsdown, and Fawkham, in Kent, and levy rates and charges in the enlarged area.

Nuneaton Gas.—The Nuneaton Gas Company will apply for power to acquire more land and construct additional works for the manufacture and storage of gas and residual products. Further capital will be required.

Perranporth Water.—The Perranporth Water Company will apply for authority to construct works, consisting of a storage and a service reservoir and two aqueducts, in the parishes of St. Agnes and Perranzabuloe, and supply water in the last-named parish, forming the township or place of Perranporth, and the villages, hamlets, farms, factories, houses and buildings along, or adjacent to, the line of pipes or mains. Money powers will be required.

Pinner Gas.—Application will be made by the Pinner Gas Company for power to construct and maintain additional works for the manufacture and storage of gas and residual products on land belonging to the Company adjoining the existing works, substitute a sliding-scale for a fixed maximum price of gas, increase the share and loan capital, and provide for the consolidation or conversion of that now existing.

Portsea Gas.—The Portsea Island Gas Company intend to apply for authority to acquire by agreement certain lands in the parish of Cosham, and erect thereon buildings and plant for the manufacture and storage of gas and residual products, and dwellings for the workmen and other persons employed by the Company. Additional capital will be required.

Slough Gas.—Application will be made by the Slough Gas Company for authority to raise additional capital.

Slough Water.—The Slough Water Company will apply for power to raise more capital, and extend their limits of supply so as to include the parish of Wexham, in Buckinghamshire.

South Staffordshire Water.—Application will be made by the South Staffordshire Water Company for power to raise more capital.

Swaffham Gas.—Application will be made by certain parties carrying on business at Swaffham under the style of the Swaffham Gaslight and Coke Company for power to maintain, alter, and extend the existing gas-works, and supply gas, meters, fittings, stoves, &c., within and beyond the limits. Additional capital and borrowing powers will be required.

Tilehurst, Pangbourne, and District Water.—The Water Company supplying the above-named places will apply for authority to extend their limits so as to include the parish of Whitchurch, in Oxfordshire, and exercise therein the usual powers granted to suppliers of water. Additional capital will be required.

Woking District Gas.—Application will be made by the Woking District Gas Company for authority to raise additional capital.

Wokingham Water.—Additional capital powers will be applied for by the Wokingham Water Company.

Under the Electric Lighting Acts, 1882 to 1888.

Applications will be made under the above-named Acts for powers in regard to the supply of electricity for lighting and other purposes in the following places: Aberavon, Aberdare, Abertillery, Alfreton, Alnwick, Annfield Plain, Ashton-in-Makerfield, Aspull, Atherton, Barry, Benfield-side, Benwell and Fenham, Beverley, Birstall, Blackrock, Briton Ferry, Bromsgrove, Burgess Hill, Cannock, Carnarvon, Chesham, Cheshunt, Clayton-le-Moors, Clydebank, Consett, Crieff, Crompton, Dalkeith, Deptford, Dollar, Dorchester, Dorking, Dungannon, East Cowes, Ebbw Vale, Falkirk, Faversham, Felling, Foots Cray, Friern Barnet, Frome, Galashiels, Goole, Gourock, Great Harwood, Ham, Hampton, Hampton Wick, Handsworth, Heston and Isleworth, Hindley, Hoddesdon, Honley, Ilkley, Ince-in-Makerfield, Isle of Thanet, Jedburgh, Kildare, Llandaff and Dinas Powis, Lewisham and Penge, Lichfield, Llangollen, Lyndhurst, Macclesfield, Marylebone, Melrose, Midland district, Mitcham, Mountain Ash, Neath, Newbury, New Hunstanton, Northfleet, Northwood and Ruislip, Norton, Notting Hill, New Hunstanton, Oban, Pickering, Pontypridd, Pokesdown, Pudsey, Rickmansworth, Rhondda, Rishton, Ross, Roundhay and district, Royton, St. Austell, Shildon, Sittingbourne, Skipton, Stoke Newington, Stratford-on-Avon, Teddington, Thornhill, Todmorden, Tredegar, Trowbridge, Ware, Warwick, Waterford, Wellingborough, Wellington (Salop), Whitley and Monkseaton, Widnes, Workington, Worsley. [Applications with respect to other electricity supply projects will be made in Private Bills.]

NOTICE OF AN APPLICATION TO THE LOCAL GOVERNMENT BOARD (SESSION 1901) FOR A PROVISIONAL ORDER

Under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875.

Shoeburyness Urban District Council Gas.—Power will be sought by the Urban District Council of Shoeburyness to maintain and continue

the undertaking of the Shoeburyness Gas Company, Limited; manufacture, supply, and deal in gas, residual products, stoves, engines &c.; construct, enlarge, and remove buildings and apparatus for the manufacture and storage of gas and residual products; levy rates, rents, and charges; and purchase land required for the above-named purposes. Authority will be required to apply the funds of the Council and raise more money.

LEGAL INTELLIGENCE.

KENDAL COUNTY COURT.—Tuesday, Nov. 27.

(*Before His Honour Judge* STEAVENSON.)

Claim for Compensation against the Kendal Corporation.

This was a case in which Margaret Whitwell, widow of Thomas Whitwell, late in the service of the Kendal Corporation, who was alleged to have died from injuries sustained by him through having been poisoned by an escape of gas while connecting a pipe with a gas-main on the 20th of August last, brought a claim against the Corporation for £200 compensation, under the Employers' Liability Act, 1880.

Mr. SHARPE appeared for the plaintiff; Mr. GREER represented the defendants.

Mr. SHARPE stated that the deceased, who was a gasman, was employed on the 20th of August last, with three other men, none of them being what might be called skilled workmen, in making a connection between a 3-inch main and a 2-inch branch pipe. He would suggest, as a reason for saying that they were not skilled, that the deceased was in receipt of 22s. a week. The men were employed at the corner of Sandes Avenue, in Kendal, where there was a trench dug about 4 feet wide and 17 yards in length; the depth of the main from the surface of the ground being 2 ft. 10 in. On reaching the main, the men proceeded to use a brace-bit for the purpose of boring it; the hole which it was necessary to make being a little more than 2 inches, and in making a connection with so large a pipe, his Honour would think that some means would be provided by the Corporation for the purpose of cutting off an escape of gas. But there were no stopcocks of any sort or kind on either side of the place where they were making the breach; and the men were not supplied with any means of stopping the flow of gas. Therefore at this point he said that there was a defect, in there being no means to prevent danger to the lives of the workmen. Secondly, there was no foreman present. The Gas Manager (Mr. T. N. Ritson) was away from home; and neither of his foremen was there. What happened was that the deceased went to the place using a rude tool—a brace-bit which was not round, but V-shaped—for boring the hole; and it was the practice, when this had been used, for the men in turn to take a chisel and chip round the edge of the hole, notwithstanding that all the time the gas was escaping in volumes. The only thing there was to stop it was a piece of tow, or something of the sort; and this being so, he submitted that there was gross inefficiency of plant. Mr. Sharpe spoke of what he said was the usual method of making connections of this kind, and describing what happened in the present case, after which he proceeded to call witnesses.

Mrs. *Margaret Whitwell* said she was the widow of the deceased, and was his executrix. Her husband was a gasman in the employ of the Kendal Corporation, and met with his death while at work on Aug. 20 last. His wages were 22s. a week during the past few years. Previous to this he had 20s. a week while in the employ of the Corporation.

Cross-examined: He had been employed for 22 years at the gas-works—formerly under the Gas and Water Company, and latterly under the Corporation—and during all this time he was working among gas, first at one job and then at another. He had been six weeks absent from work previous to the week before the accident; but, so far as she knew, he was sound and healthy when he went out, and had been so for a week. She did not know anything about his having heart disease. Some weeks he did not earn 22s.

Mr. GREER remarked that three years' wages amounted to £159.

Mr. SHARPE contended that the sum they were entitled to claim was £171 12s.

Witness, in re-examination, said that during the six weeks her husband was suffering from a bad hand caused by lead poisoning.

Thomas Coleman, examined by Mr. SHARPE, said he was in the employ of the Corporation on Aug. 20, when he was working at the corner of Sandes Avenue and Beezon Lane. Thomas Whitwell, James King, and Richard Wilson were with him on the job, making the connection spoken of. Before beginning to drill the main, they did not take any precaution to cut off the flow of gas. Neither of the foremen was there. They were provided with a drill of the ordinary shape, round which they put some cotton waste; and it was worked with a brace. He began the drilling, and was at work upon it when the point of the drill first broke through. There had been a ½-inch hole to start with, in which was a plug, which they had to take out, and drill to make the hole larger. They prevented the escape of gas with the cotton waste. He could not say that there was no escape; but very little came out. Whitwell began to drill an hour after he and another man had been so engaged. He was not near them when they were at it, but was making pipes ready for the connection, some 10 feet away. He did not do any chipping. Witness worked for an hour, and then came out of the trench; being rather hot, but nothing more than that. Whitwell and King then went on drilling; the former for not more than five minutes. The hole they were in was 4 ft. by 3 ft.; and then there was a trench from it, 17 or 18 feet long. After Whitwell had been drilling for five minutes, witness told him to come out, and he would take the brace off and see if the tap would enter. Whitwell then came out, and went to the far end of the trench and sat down on the edge, with his feet in the cutting. Any smell of gas there was would be very slight then; there was nothing to affect anyone. Ten minutes or so after Whitwell got out of the hole, he complained about a pain at the back of his head. He said: "A pain has struck me at the back of the head, Tom. Gas never did this before." If there was any gas, it was very slight; so slight that he durst have struck a match while in the hole. Witness went on chipping, and said to Whitwell: "You will be all right perhaps in a few minutes." He looked at him, and saw that he was trembling; and he and Wilson got hold of his arms and assisted him out of the hole where he was sitting, and walked him up and down. He seemed to be pretty good on his legs, but did not appear to get better. Before this, witness had asked him if he would have a drop of whisky; but he said: "No; I shall perhaps be all right presently." Witness then sent for a doctor; but the one he sent for did not come. Dr. Brumwell came about two minutes after Dr. Watson; and they ordered Whitwell to be taken to the hospital. At this time he did not notice the gas at all; the cotton waste and the tallow upon it stopped the escape. There was a slight pressure on the main. He once before saw Whitwell gassed, and had come across two cases in six years; but not in joints similar to this. He had not seen Whitwell gassed several times.

Mr. SHARPE here remarked upon the evidence given by the witness before the Coroner, which, he said, was different on this point from the statement he now made. He did not know whether his Honour would see grounds for his applying to the Court.

His HONOUR would not say that he did not; but he was loth to interfere.

Mr. GREER remarked that witness might be unwilling. He was his (Mr. Greer's) witness; but his friend had called him, and must take the consequences. He had not shown himself a hostile witness.

Mr. SHARPE said that if his Honour would look at the report of the Coroner's inquest, he thought he would see that witness then said he had seen the deceased gassed several times. So he was instructed; but now the witness said he had seen him gassed only once.

Witness, in reply to his Honour, repeated that he had not seen deceased in that condition several times. He had only seen him so once; but from what he had heard, he had been gassed several times. He saw no signs of vomit in the trench.

Cross-examined: He had been employed at the gas-works for six years next January; and all this time Whitwell had been there also. Whitwell had had a great deal of experience in making connections. He was over witness, and was trusted to act without supervision by the foreman. When they first knocked the plug out of the hole on this occasion, the gas would escape more freely than when they were driving the bit. He and King knocked out the plug, and Whitwell was not taking part in the operation. Neither witness nor King was affected in the slightest degree by the gas. The brace and bit produced were those they used. As they worked, their heads would not be above the level of the ground. At the place where this happened, four road ends met, so that it was open every way. The block of wood affixed to the bit was produced; witness explaining how it fitted the hole that was being bored. In addition to this, there was the cotton waste as a further protection against the escape of gas. As the bit was bored in, the wood and the cotton waste filled up the hole. When he told Whitwell to come out of the trench, he was quite "jokey." He did not then complain in the slightest; nor was there any appearance of there being anything wrong with him. He went along the trench, and sat at the end of it. Witness went back and took off the brace, and tried the tap; and for a moment or two the hole would be quite open. But any gas there was had not the slightest effect upon him. He had made many connections of pipes; and the only effect he had ever experienced was a little pain across the head, which was when he was making a connection with a bigger main than this. Witness explained the method of using bladders when making connections; and said if they were proper bladders, the gas would not escape. But it depended how they worked.

His HONOUR remarked that this was not the issue he had to try. The question was not whether the best method had been adopted; but whether, given the method that had been adopted, there had been negligence. The Corporation were not obliged to employ every new system.

James King deposed to being present on the above occasion. There was a slight escape of gas; but he did not notice it. He did not see any vomit in the trench, but was himself sick "through swallowing a chew of tobacco," and not through gas.

Cross-examined: He had been employed at the gas-works for over three years, and had not seen anybody gassed; nor had he been gassed himself. He had never felt any ill-effects from gas escaping while the bit that was in use on the day in question was being employed. When Whitwell came out of the trench, he saw nothing peculiar about him. He was not gasping or choking, and spoke quite in the ordinary way.

Richard Wilson said he was employed as a gasman by the Corporation and was present on the occasion referred to, though not when the men first began to drill. He was sent for the block-tap to enlarge the hole; and when he returned Whitwell was drilling. He went on for about three minutes, and Coleman took his place. Whitwell did not turn-to again. While Whitwell was at work, witness noticed about as much gas escaping as might come from an ordinary gas-burner. The gas would come from the edges of the drill. Whitwell did not make any complaint till after leaving the hole; and he then said the gas had made him bad in the head, after which he was bad in the neck. He then began to roll on his stomach. Witness and Coleman walked him away from the cutting to the other side of the road. Looking at a job of this sort, he should not expect a foreman to be there when they had a man of Whitwell's experience and length of service. He himself, had he been Whitwell, would have taken it as an insult if a foreman had been present. The foreman came afterwards.

Cross-examined: Whitwell could not finish the work because he was in the hospital. He himself had been kneeling down, with his face over the hole; and he was not gassed. There was nothing peculiar in Whitwell's appearance when he came out of the hole; and it would be about five minutes after when he made a complaint.

Mr. *Alfred Hall*, examined by Mr. SHARPE, said that on the afternoon of Aug. 20 he was near the cutting where the men were working; and he saw the deceased. Witness was smoking a cigarette at the time. In consequence of something that was said to him, he put it out. He noticed an escape of gas, which was not strong at first; but when the pipe was drilled, it was stronger. Coleman chipped the edges of the hole, after which Whitwell did so; and he then went away and complained of a pain at the back of his head, and rolled about on the side of the cutting. Witness could smell the gas, and felt as though he had had a drink or two of beer.

In cross-examination, witness said that, after Whitwell first went away

from the cutting, he came back and leaned over the hole, and said he had never felt so bad before. Then he went away again, and rolled on his stomach.

Mr. *John Atkinson* spoke to seeing Whitwell kneeling at the end of the trench, watching Coleman and King, who were working the brace. He smelt gas very strongly, and made a remark upon it.

Mr. *Frank Todd*, a member of the Ambulance Association, said he saw Whitwell sitting on the ground, and looking very ill. There was a smell of gas; and he suggested that they should take Whitwell where he would get more fresh air. This was done. He went for water, and dashed it on his face and neck.

By Mr. GREER: Whitwell looked very ill, and was yellow in colour. He spoke something like a drunken man.

Mr. *J. T. Battersby*, Manager of the Ambleside Gas and Water Works, said he should not call it a proper thing to drill a 2-inch hole in a 3-inch main, because he should consider that it would weaken the pipe too much. There would certainly be some escape of gas; but with care this could be minimized. In making a connection of this kind, the usual and best way was to drill the main and bladder it, the process being to drill two small holes in the main, about ¾ inch, insert a bladder in each, and blow them up. He would put them not less than 12 feet apart. This would prevent gas escaping between the two bladders; and a new connection was put between them. With a drill such as that produced, gas would escape; but not in so large a volume as if it had not the wood block around it.

In reply to Mr. GREER, witness said he had been at Ambleside for two years as Manager, and eight years as fitter. He did not say that in that time he had never drilled a hole in a pipe without using bladders. He had drilled them with a flat drill, and without the wooden block.

His HONOUR observed that the block produced was packed with cotton wool and candle grease apparently.

Witness (continuing) said he did not think there would be much difference between a brace with wood round it in a 2-inch hole and an ordinary brace in a 1-inch hole. It was not a proper job to put a 2-inch hole in a 3-inch main, as it would weaken the main. Weakening the pipe, however, would have nothing to do with the escape of gas. He had never seen an account of bladders bursting.

By Mr. SHARPE: They might burst, if used too long or too frequently.

His HONOUR said this evidence was a long way astray from the issue. What he had to try was the question whether there was a defect in the method by which the work was actually done.

Witness added that he should call 22s. a week labourer's wages. He thought there ought to have been a foreman over the men employed in making this connection.

Dr. *Gibson*, examined by Mr. SHARPE, said he was asked by Dr. Brumwell to go to the hospital on Aug. 20. It was close upon 5 o'clock when he arrived. He saw deceased, who was then in a state of coma, and died about an hour afterwards without having rallied. Everything possible was done. He formed the opinion that the cause of death was apoplexy. He was afterwards present at the postmortem examination performed by Dr. Leeming; and Dr. Watson was there also. They found the brain normal and healthy, which was inconsistent with death from apoplexy. The lungs and liver were healthy; but the heart was in an advanced state of fatty degeneration. As regards the valves, they were normal. Clots of blood were found; but they were not such as would operate actively in causing the man's death. No doubt the heart had been in its then condition for a considerable time; but in the absence of any other extraordinary cause, he might have lived for a number of years. Any great exertion might have proved fatal. He concluded that gas had been the cause of death; the heart being weak in the first place.

By Mr. GREER: There was nothing to indicate that sufficient gas to injure a healthy man had been taken into the system. So far as positive evidence went, there was nothing to show gas poisoning at all. His ground for assuming that gas killed the deceased was that it was found he had not died of apoplexy. The symptoms of gas poisoning and apoplexy were very much the same. They had heard, before the examination, that deceased had been in the trench mentioned. Witness had never before had a case of gas poisoning under his observation. He did not think that the appearances of gas poisoning were definite and unmistakable. The symptoms would depend upon the amount of gas inhaled. Assuming there had been a sufficient quantity to kill a man, there would be insensibility and coma, stertorous breathing, a flushed face, and contracted pupils, though the symptoms would not necessarily show immediately. The more fresh air a man had after inhaling gas, the better would be his chance of recovery, if he had not inhaled too much. The chances were, however, against him, because gas formed a compound with the blood which it was very difficult to separate from it. There might be an improvement to a slight extent, and then a relapse. So far as he knew, there was only one form of gas poisoning. It might be attended with nausea and vomiting. The best thing to do for a sufferer would be to take him into the open air. He did not think that the results of gas poisoning would be more serious in a man affected with bronchitis than in a healthy man. The results would be more serious in the case of a weak heart. The state of the deceased's heart was such that a strain at any time might cause death, without gas poisoning. There was nothing in the postmortem symptoms to indicate altogether that death was due to a strain acting on a weak heart.

His HONOUR: I do not see where we are going. The question is, apart from the fact that it is your opinion that he died from poisoning, were any of the symptoms you saw consistent with his having died from a strain?

Witness: It would be possible.

By Mr. GREER: He did not at the postmortem examine the blood with acid, to ascertain whether there were indications of gas poisoning. Sometimes the blood would be a cherry-red colour, and at other times dark. This was neither. A change of colour in the blood did not occur in every case.

Dr. *Leeming* said he had been medical attendant to deceased for fifteen or sixteen years. After his death he was requested by some of the relatives to make a postmortem examination. Deceased was ill for a time previous to Aug. 20; but he should not say that it was from inherent bodily weakness. He came to the conclusion from what he found by postmortem examination that death was caused by gas poisoning. The man was fairly strong; but there were symptoms of heart troubles which did not show themselves outwardly. Until he had made the examination, he concurred with others in thinking that death was due to apoplexy.

Mr. SHARPE having addressed his Honour,

Mr. GREER said he had hoped it would be considered that there was no case for him to meet. Having spoken upon the facts, he proceeded to call witnesses for the defence.

Dr. *Cockill* said he had been consulted with reference to this case, and had heard the evidence given as to the symptoms, both at the time and immediately after the postmortem examination. Coal gas as a poison acted by means of carbonic oxide; and he had had actual experience of four cases of such poisoning. He had also made a special study of the symptoms of gas poisoning at the time the gas was received; and these would vary according to the amount of gas present. It was not necessary to speak of circumstances other than those attending the present instance. Among the symptoms that would be exhibited in a case of gas poisoning from tapping mains would be nausea, sometimes vomiting, depression of spirits, drowsiness, flushed face, flushed vessels, hilariousness, passing on to coma, with or without convulsions. Sometimes there was partial paralysis before coma set in; and sometimes it came on immediately after inhalation. The usual method of dealing with such instances was by removal to the open air, and the application of pure oxygen. He had heard the history of this case; and, in his judgment, the man could not have inhaled sufficient gas to cause poisoning as described, because another man who was there the whole time was not affected. From the evidence he had heard, the man had been five minutes in the trench, and could not have inhaled sufficient gas to cause poisoning. Speaking of postmortem symptoms of such poisoning, witness said the tissue of the brain would be engorged, and generally of a pinkish colour; and the tissue of the lungs a bright red. The blood might be of a dark colour; and there would be a smell of gas escaping from the lungs under pressure.

John Harrison, foreman at the gas-works under Mr. Ritson, said he had about forty men to look after, and had been foreman for over seventeen years. Previous to that he was a fitter, and had had large experience in the laying of pipes, fittings, and repairs. On Aug. 20, he gave the deceased instructions to put in the service-pipe referred to. For a good many years he had been trusted to lay such pipes without supervision, and had proved himself a competent man. It was left to him to take such tools as he required. The brace and bit in question had been in use for four or five years; and before that they employed the brace without the wood, which was afterwards put on to decrease the escape of gas by steadying the drill. He had never heard of any gas poisoning from using it. He went to the job in question at about 2.30; but the men were then only opening the ground, not having found the main. Later he heard of Whitwell being taken to the hospital, and went and finished the job off. Coleman had had experience in such work, which he could do by himself. The pipe was quite right; the main not having broken in the least. He took out the tap, to see if it had gone far enough in, and then gave it three or four turns. The gas did not affect him, the pressure being very slight. There had never been any complaint about the tools, which had been spoken well of by the man who came to grief.

Mr. *Robert Porter*, Manager of the Elland Gas-Works, said he had seen the tool that was used (a brace and bit); and in his judgment it was a proper implement with which to drill a hole as described. The wood attached made it safer than it would otherwise be; but nine-tenths of such operations throughout the country were done with the drill alone. It was the first time he had seen the wood used for the purpose. Throughout the country there would be something like five hundred holes drilled daily; and he had never heard of a death from gas poisoning in consequence of these operations with a naked drill. He approved of the method adopted in making the connection with the main in preference to the T connection, in which there would be more risk. It was desirable to do without bladdering as much as possible; for bladders were a source of danger, of which they had painful experience at Manchester last December, when the Chief Engineer there was killed.

Mr. *John Swan*, Manager of the Ulverston Gas and Water Works, gave corroborative evidence.

Mr. *T. N. Ritson* said that he had known for a number of years the brace that was used for boring; and he had never heard of a man being gassed while using it. He had never received any complaint of it being dangerous or inefficient. He did not invent it, but was very much pleased with it; and it was going to be copied by many other gas workers. In making connections, it was impossible to turn the gas off altogether. He disapproved of the use of bladders. Whitwell had had constant experience. He was a service layer absolutely, and was competent to do such work alone, and to be in charge without other assistance. If witness or the foreman had been on the spot when the connection in question was made, it would not have been done in any different way. He had never heard of another case of gas poisoning in Kendal.

Mr. GREER stated that he had three other witnesses, who would say very much what had already been said; and therefore he would not call them.

Mr. SHARPE having replied on the whole case,

His HONOUR said he found that Whitwell was a man of great experience, and was in a position of superintendence on the occasion in question. He was a competent man, and it was not necessary that there should be anyone over him. He found that the drill and the brace were in good order, and in no way defective; neither was any part of the arrangements defective. There was no danger in the operation of drilling. Having found this, judgment must be for the defendants.

DENBIGH COUNTY COURT.—Tuesday, Nov. 27.

(*Before His Honour Judge Sir* HORATIO LLOYD.)

Damage to Gas and Water Pipes by the Use of Steam Road-Rollers.

To-day his Honour gave judgment in an important case bearing upon the above subject. The plaintiffs were the Denbigh Gas and Water Companies, and they sued the Mayor and Corporation of Denbigh for damages caused to their main-pipes, &c., by the use of the Corporation's steam-roller. The case of the Water Company was heard first; and as the facts in that of the Gas Company were somewhat similar, it

was agreed that the judgment in one case should apply to the other. The Water Company claimed £13 2s. 1d., being damage alleged to have been done to their pipes between Dec. 16, 1898, and Nov. 30, 1899; and they also asked for an injunction restraining the Corporation from using the roller in future. The defendants gave notice of a special defence under the Public Authorities' Protection Act, 1893, which they filed on the 11th of July last, but which the Judge at that time said was a day too late, and therefore he did not entertain it.

Mr. E. Roberts appeared for the plaintiffs; Mr. Ralph Bankes represented the Corporation.

His Honour, in the course of his judgment, said the pipes were originally laid, under statutory powers, in 1864, and, subject to occasional repairs, were the same pipes. In November, 1898, the defendants purchased a steam-roller; and the breakages in the pipes had all occurred since that time. No negligence had been suggested in the management of the steam-roller by the defendants, who were simply using a lawful and acknowledged instrument; but they were liable for injury resulting from its use, unless the plaintiffs had been guilty of negligence in the laying or condition of their pipes. The question, therefore, was whether the pipes were properly laid in 1864, and were sufficient for the then state of the ordinary traffic of the district. The Water Company could not be expected to alter their system, and relay their pipes deeper, because steam-rollers, which might be of still increasing weight, were from time to time introduced. He concluded, on the evidence, that the pipes, in some places where injury occurred, were properly laid, though not so deep as it would be advisable to place them. But the fact that they had withstood ordinary traffic for so many years without injury was, to his mind, sufficient proof that the pipes had been laid deep enough to stand any traffic but that occasioned by the unforeseen use of heavy steam-rollers. This, in his opinion, made the defendants liable. Those who use highways must do so with due regard to the rights of others lawfully using them; and bringing upon the road an unusual and extraordinary load, however lawful, carried with it liability, if the property of others was injured. Having quoted the case of *The Gaslight and Coke Company v. The Vestry of St. Mary Abbotts*,* and the recent decision of the Court of Appeal in Ireland in the case of *The Alliance and Dublin Consumers' Gas Company v. The County Council of Dublin*,† his Honour said he adopted the ruling in these cases; and as he was satisfied, on the evidence, that injury had been done by the steam-roller, and might occur again, he would grant an injunction. As to the damages, he was not satisfied that the plaintiffs were entitled to all they claimed, because he was not clear, owing to the insufficient depth at which the pipes were laid, that the breakages might not have been caused by the ordinary traffic of the district, apart from the steam-roller. He would therefore disallow their claim for damages in respect of some of the breakages, and would give judgment for £6 8s. 4d. An injunction would be granted against using a steam-roller on any road in which the pipes of the plaintiffs had been laid, so as to break or injure any pipes which had been properly laid in such roads; regard being held to what, at the time of the laying of the pipes, was the ordinary traffic, and reasonable means of repairing and maintaining the road.

The judgment will apply to the case of the Gas Company; but as no items of claim were submitted at the hearing of the action, his Honour could not make any order as to the amount of damages; this being left to the parties themselves to agree upon.

It is probable that the Corporation will apply for a new trial, as they understood that the plaintiffs had consented to withdraw their claim for an injunction.

The Bankruptcy of Mr. M. J. Wells.

In the Bankruptcy Court, last Tuesday, Mr. Registrar Linklater had before him an application by Mr. Maurice J. Wells, stock and share broker, of No. 10, Union Court, Old Broad Street, for an order of discharge. The proofs actually admitted against the estate amounted to £23,229; and the probable claims not yet admitted were estimated at £8049. The assets had at present realized £15 17s. 6d. only; and it was stated by the Trustee that no dividend could be paid to the creditors. The receiving order was made on the 16th of March last, on a creditor's petition. The bankrupt stated in his public examination that in January, 1891, he commenced business as an outside stock and share broker; and the net profits of the business amounted to about £500 a year down to the beginning of 1899; but last year's trading showed a loss. He attributed his insolvency to loss on the promotion of companies and to his liability on accommodation bills. In 1898, he was interested in the promotion of the Hydro-Incandescent Gaslight Company, Limited, and the Plymouth Wharves, Limited. The Official Receiver reported that the bankrupt's assets were not of a value equal to 10s. in the pound on the amount of his unsecured liabilities; that he had contributed to his bankruptcy by rash and hazardous speculations relating to the promotion of companies and transactions on the Stock Exchange; and that he had been guilty of certain misconduct with regard to his property and affairs. The Registrar described the case as a very bad one, and suspended the discharge for five years.

Gas Engineer and Money Lender.

Mr. Thomas Stormonth, jun., gas engineer and money-lender, attended at the Exeter Bankruptcy Court on Thursday for his adjourned public examination. This matter has already been referred to (see *ante*, p. 433). In answer to questions, he said he had practised as a gas engineer. He was at one time Consulting Engineer to the Exmouth Gas Company, and he had other appointments at Tavistock and Launceston, though at the latter place he did not do the work. A number of questions were put to the bankrupt respecting property which it was alleged was not accounted for in his bankruptcy. He denied that he had been responsible for any concealment. The examination was closed.

Charge of Stealing Gas.

At the Southwark Police Court on Monday last week, Louis Muncey, aged 30, described as a fitter, of North Street, Charlton, was charged, on remand, with stealing a quantity of gas, value 1s., from No. 294, Lynton Road, Bermondsey, in April, 1899. Mr. Passmore prosecuted. Mrs. Syers stated that at the time of this affair she was a lodger at the house of the accused. Soon after she went there, she noticed a strong smell of gas, and spoke to the prisoner about it. A little later she remarked to Mrs. Muncey that she had often wondered where that lady cooked her food; and Mrs. Muncey replied: "A good many people would like to know." It transpired that the cooking was done on a gas-ring in an outhouse, and Mrs. Muncey said her husband made his own gas. She showed some white stuff like borax, from which she said he made the gas. The prisoner also admitted to the witness that he made his own gas, and could make her some for 2d. a night. One of the Superintendents of the South Metropolitan Gas Company said he found that a connection had been made with the pipe leading to the meter from the main, so that the gas used would not be registered. When prisoner was told that he would have to go before a Magistrate, he went upstairs, and escaped by jumping out of a window on to the top of an outhouse. Detective-sergeant Lee stated that there had been several previous convictions; the last one being seven years' penal servitude for burglary. The accused was committed for trial.

Leaving Work without Notice.

The Kidderminster Borough Bench recently had before them some of the men employed by the Kidderminster Gas Company, who had been charged, under the Conspiracy and Protection of Property Act, with breach of contract by leaving their work without notice. It was stated, on behalf of the prosecution, that one of the men—Samuel Guest—a coke wheeler, suddenly left his work, necessitating the making of other arrangements. After the second night draw of the retorts, the defendants left their work without any communication with the foreman; and no persuasion could induce them to remain. The result was that there was a falling off of at least 100,000 cubic feet of gas that night. The ringleader in the affair was a man named Harrington; and his case was first heard. The foreman (Evan Davies) described what happened at the works, and showed that, though Guest had gone, the stokers were well supplied with coal. The Bench found Harrington guilty, but reserved judgment until the other cases had been taken. The charge against Guest was then heard. The man admitted leaving, but said he was not in a fit condition to work. Mr. Vachell, who represented the Company, said they did not press the charge against the other three men. The Mayor (Mr. P. Adams) said it was evident that the men did not realize the seriousness of their conduct, and the Bench would, in consequence, deal leniently with them. Each defendant would be fined 10s. and costs, or seven days. If any other case of the same kind came before the Court the defendants would be dealt with more severely.

New Reservoir for Tamworth.—The Tamworth Joint Water Committee have decided to construct an additional reservoir at Hopwas, at an estimated cost of £6500. The capacity will be 500,000 gallons.

Joint Chemical Works for Gas Undertakings in the Aire Valley.—A proposal has been set on foot in the Keighley district for the establishment of joint chemical works for a number of gas undertakings in the Aire Valley. The idea emanates from Keighley.

Burgess Hill Water Company.—At the half-yearly meeting of this Company last Tuesday week, it was reported that there was an available balance of £1118, which enabled the declaration of a dividend of 3 per cent. on the original and new ordinary shares, free of income-tax.

Grand Junction Water Company.—At the half-yearly meeting of this Company on the 12th inst., the Directors will report that, after the payment of dividends at the rates of 8, 7½, and 7 per cent. per annum on the several classes of shares, and providing for the Company's proportion of the interest on the debenture stock and expenses of the Staines Reservoirs Joint Committee (£3925), the amount of undivided profit carried forward will be £24,160, as compared with £21,592 at the commencement of the half year.

The St. Helens Explosion and the Damage to the Gas-Works.—The action which the St. Helens Corporation agreed to take against the United Alkali Company, Limited, to prove liability and seek compensation for the damage caused by the great explosion which partially wrecked St. Helens, and seriously interfered with the working of the Corporation gas-works in May, 1899, will be heard at the forthcoming Liverpool Assizes by Mr. Justice Bucknill and a Special Jury. The Corporation are claiming £5000 for injury to their gas-works and other property, caused by the explosion of dangerous chemicals and other materials stored by the defendants on their premises, and for injury to their gas-works and other property caused by defendants' negligence. The explosion, it will be remembered, created a great sensation at the time, and probably did damage in the town to the amount of £30,000, besides which five men were killed, and several people injured. At the time the question of compensation was widely discussed; and efforts have been made to expedite what was looked upon as the test of liability by the Corporation.

The Projected Large Water Scheme for Leeds.—Our readers will probably have seen, from the abstracts of parliamentary notices which appeared in the "Journal" last week, that the Leeds Corporation are projecting a big scheme for providing additional supplies of water for the inhabitants of the city. As already mentioned, it is intended to impound the head waters of the Rivers Burn, Laver, and Skell, draining the moors above Ripon, and convey them to Leeds, a distance of about 40 miles. In order to effect this object, there will be built altogether six large reservoirs, ranging from 70 acres to 138 acres in area. They will be formed by constructing embankments or dams across the natural valleys formed by the rivers; the embankments varying from 280 to 600 yards in length, and from 52 to 105 feet in height. In addition to this, an aqueduct some 25 miles in length will be constructed to carry the water to the existing works of the Corporation. It is expected that the quantity of water available for Leeds from this gathering-ground will be about 18 million gallons per day; and, in addition to this, provision will be made for storing and discharging daily down the rivers compensation water for the use of the riparian owners below. The preparation of all the necessary parliamentary plans and estimates has been entrusted by the Corporation to Mr. E. J. Silcock, Assoc.M.Inst.C.E., of Leeds.

* See "Journal," Vol. XLIII., pp. 873, 917; Vol. XLV., pp. 539, 823.
† *Ibid.*, Vol. LXXV., pp. 752, 815; and *ante*, p. 100.

MISCELLANEOUS NEWS.

SCHEME FOR THE SUPPLY OF FUEL GAS IN THE MIDLANDS.

Among the abstracts of the notices for Bills for next year which appear in our "Parliamentary Intelligence," one will be found which briefly intimates that a project is on foot for supplying "Mond Gas." The following particulars in regard to the scheme are taken from the notice which has been published:—

It is proposed to apply for parliamentary sanction to the incorporation of a Company to manufacture, sell, and supply, within a defined area, gas, and particularly the product commonly known as "Mond Gas," for motive or other power, heating, or any other purpose to which such gas can be applied, except illumination; and to manufacture, supply, or let on hire, machinery and apparatus of any description for, or in connection with, these objects, or any of them. Power will be sought to take and use, compulsorily or otherwise, and to hold, for the purposes of the intended Act, certain lands, buildings, and property specified, situated in the parishes of Tipton, Bilston, Darlaston, Kingswinford, and Smethwick. Upon all or any of these lands the Company propose to erect, maintain, and work all the necessary producers, machinery, and plant for, or incidental to, the production and storage of Mond or other gas, and for the manufacture and conversion of the residual products arising therefrom; and they will ask for authority to sell and deal in such residuals. Power will be sought to open and otherwise interfere with the streets, roads, and highways within the specified districts, for the purpose of laying mains, pipes, and appliances under or above them; and also to alter or otherwise interfere with gas and water pipes, telegraph and other wires, electric lines, &c.

The area over which the Company will ask to have powers comprises the boroughs of Smethwick, Walsall, Wednesbury, West Bromwich, and Wolverhampton, and the districts of the Urban Councils of Amblecote, Bilston, Brierley Hill, Coseley, Darlaston, Handsworth, Heath Town, Perry Barr, Quarry Bank, Rowley Regis, Sedgley, Short Heath, Tipton, Wednesfield, and Willenhall, and those of the Rural Councils of Kingswinsford and Walsall (including Bentley), in the county of Stafford, and the borough of Dudley, and the districts of the Urban Councils of Lye and Wollescote, Oldbury, and Stourbridge, and of the Rural Council of Halesowen, in the county of Worcester.

For the supply of Mond or other gas and residual products, and for the supply and hire of machinery and apparatus in this area, the Company will ask for the usual power to levy and recover rents, rates, and charges. They will also seek to be empowered to enter into agreements with local authorities, companies, and persons; to make, alter, and rescind regulations and bye-laws for, or in relation to, the use, misuse, or waste of Mond or other gas; and to impose and recover penalties for the breach of any such regulations or bye-laws. Authority will be sought for the Company, their officers, servants, and workmen, to enter upon lands, buildings, and premises, and to examine any machines, fittings and apparatus, engines, and machinery supplied by them, and any meters or other instruments used for determining the quantity or amount of gas or motive power supplied or used, and to execute such works as may be necessary for the regulation of such use and the prevention of misuse or waste.

They will also ask for power to impose and recover penalties for the tampering or fraudulently interfering with any such machines, fittings, apparatus, engines, or machinery, or any such meters or other instruments.

The Company wish to be authorized to purchase, acquire, and hold, work, and use patents or patent rights or licences for the production or use of Mond or other gas for any of the purposes specified, and any other products or bye-products of coal, or to enter into agreements for the purchase thereof, or to confirm any agreement which has been or may be entered into for such purchase or acquisition; and to sell or let any patents or other rights which they may acquire under the powers of the intended Act or otherwise, or to grant licences to use the same.

It is proposed to incorporate with the intended Act, and apply to the Company and to the undertaking and works authorized thereby, whether with or without modification or amendment, all or some of the provisions of the Gas-Works Clauses Acts of 1847 and 1871.

THE RESERVISTS' FUND OF THE SOUTH METROPOLITAN GAS COMPANY AND THEIR EMPLOYEES.

There have been few large industrial undertakings which have not had the ranks of their employees reduced by the calling out of the Reservists for service in South Africa; and, of those so affected, probably every one made some provision for supporting the dependents of those who had responded to the call of duty. The men of the South Metropolitan Gas Company were no exception to the general rule; but, curiously enough, recognition of their work has been conspicuously absent from the numerous lists of subscriptions for the support of the wives and families, and widows and orphans, of the soldiers, which have been published. This being the case, the Chairman of the Company, Mr. George Livesey, asked the Editor of "The Times" to grant him the hospitality of its columns to show that the employees of the Company had not been unmindful of their duty in this matter. The request was granted by the insertion last Thursday of a letter of which the following is the principal portion:—

In October, 1899, some 40 of the Company's workmen were called out as Reservists. At the suggestion of one of the foremen (Harvey), meetings of workmen were held at all the works, and resolutions unanimously passed to provide for the wives and children of their comrades at the seat of war. Every man agreed to give a weekly subscription. They then applied to the Directors, and the Company gave an equal amount; while all connected with the Company joined in the good work. Very soon the number of Reservists (including seven St. John Ambulance Volunteers) increased to 112, in addition to a few Volunteers, and most of them left wives and families. The original weekly subscription not being sufficient, the workmen at once doubled it; and now that the Reservists are returning, the higher subscription is maintained to create a fund for the widows—happily so far only seven—and orphans. The Committee of workmen fixed the allowance at 10s. a week for each wife and 2s. for each child under 15, which, with the Government grant, they considered sufficient. The Company's workmen, in number nearly 4000, have subscribed in 57 weeks £1522, and are still adding £39 per week. The contributions of the Company and other subscriptions bring the total up to £3463. The Committee men, who act as visitors, have distributed £3017. There is a rapidly increasing reserve of £436, and the balance of £10 has gone in expenses, printing, &c. [Mr. Livesey enclosed a copy of the latest weekly printed statement of receipts and expenditure at the time of writing.] The whole business has been managed entirely and most satisfactorily by the Committee of workmen, assisted by a capital Secretary, also a workman. The men generally have taken great interest in this good work for their country and their comrades, whose independence they have maintained. I confess my colleagues and I are proud of them, and at the same time gratified with this proof that their large accumulations of savings under our profit-sharing system have induced, rather than checked, generosity. This partnership, or sharing of the burden, has made the carrying of it a pleasure to which the word "burden" does not apply. The shareholders would, I am sure, have gladly taken the whole responsibility; but that would have had the great disadvantage of depriving the workmen of the opportunity of taking action.

We have received from Mr. Livesey the printed statement of receipts and expenditure for the week ending the 24th ult.—the 58th—showing the total paid out to have been £3068; the balance of the reserve fund at that date being about £465. As a proof that all are taking part in the work, it may be mentioned that the Directors contribute £1 apiece per month. The number of deaths—roughly 7 per cent.—is just about in proportion to the losses sustained by the entire army. It should be added that the employees of the other Company of which Mr. Livesey is the Chairman—the Crystal Palace District Gas Company—whose proportion of Reservists called out was not nearly so large as in the case of the South Metropolitan Company, have acted in a similar manner to those of the more extensive undertaking.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. J. Darell Blount in the chair.

The Secretary (Mr. G. R. Guyatt) read the notice convening the meeting; and the Directors' report and the accounts, from which some particulars were given last week, were taken as read.

The Chairman, having explained that the holding of the meeting had been delayed through the illness of the Manager (Mr. John Reid) and other employees at Ceará, said the working was set out in the report and accounts with so much detail that very little explanation was requisite on his part. He might observe that the Directors had been obliged to add £1419 to the capital investment in consequence of a new coal-store being required. Their coals deteriorated very considerably when exposed without cover; and so the Directors thought it necessary, to prevent injury, to extend the storage accommodation. The cost of coal had been somewhat less than it was last year, although the quantity used was a trifle greater through the larger consumption of gas. In regard to the manufacturing charges, there was a slight decrease, but an increase in maintenance, as they had added to this item a proportion of the cost of the new retort-benches. This was not considered a proper capital charge, and so it was paid for out of revenue. Salaries were also somewhat less; but their old enemy exchange (which for some years past had been advancing) again showed a little increase. But, of course, this was altogether beyond the control of the management. The net profit available for dividend (after deducting the interim payment) was £2497, against £2369. They were consequently able to declare the usual dividend, and to carry forward a rather larger amount than last year. He concluded by moving the adoption of the report and accounts.

Mr. F. A. Wallroth seconded the motion, which was unanimously adopted.

On the proposition of the Chairman, seconded by Mr. F. W. Brothers, a dividend of 5 per cent. on the preference shares (less income-tax) and of 4 per cent. on the ordinary shares (tax free) was declared for the past six months.

The Chairman said he had next to move the re-election of Mr. Wallroth to his seat at the Board, and the confirmation of the appointment of Mr. Thomas Guyatt to the vacancy on the directorate. While doing so, he wished to refer to the great loss the Company had sustained by the death of their Chairman (Mr. Horatio Brothers), who had been connected with the Board for many years, and whose acquaintance with gas matters generally had been of special advantage in carrying on the business. The Directors regretted his loss as a colleague, and also as a personal friend. Concerning Mr. Guyatt, he had, as the shareholders all knew, been connected with the Company since its inception. He had had experience that no other man associated with the Company could possibly have had. Consequently, he (the Chairman) was sure the shareholders would approve of his appointment to fill the vacant directorship.

Mr. Brothers seconded the motion, which was also unanimously carried.

Mr. Wallroth, on behalf of himself and Mr. Guyatt, briefly acknowledged the confidence of the shareholders.

The Auditor (Mr. Magnus Ohren) having been re-appointed,

On the motion of Mr. F. E. Linging, seconded by Mr. G. Dannatt, a hearty vote of thanks was tendered to the Chairman and Directors for their services during the year.

The Chairman having responded,

A similar compliment was paid to the Secretary, Manager, and other officers; and acknowledgment was duly made by Mr. G. R. Guyatt.

The Chairman said, before the meeting adjourned, he wished to refer to a circular which the shareholders had no doubt all received respecting the issue of debentures. The debentures issued some years ago would mature on Jan. 1, 1901; and the Directors considered this would be a proper occasion for applying to the shareholders for an additional amount for working capital. By examining the accounts, it would be seen that there was a sum of £52,797 invested on capital account; but the paid-up capital only represented £44,700; and the debentures that were now about to be paid off made the total £53,210. It was quite clear this left the Company without working capital. It was true they had a reserve fund, which had been set apart in former years, and which had

been put into the business and used as working capital. It was manifest that it was impossible to properly carry on the concern if they were to be hampered by the want of money. The State Government had paid up their accounts, he must say, with extreme promptitude; but whether they could continue to look forward for the next few months to a continuance of this prompt payment was a little uncertain. The province of Ceará was at present suffering from the effects of a drought, which had very much affected its commercial interests. The consequence of this was the Treasury was short of money; and if the State Government were unable to keep up the payments as exactly as they had hitherto done, the Directors would find themselves greatly hampered if they had no working capital. For this reason, they had applied to the shareholders for an amount of £17,000 of debentures to pay off the existing liability of £8500; and they proposed now issuing for this purpose £13,000. The Directors applied to the holders of the existing debentures to know whether it was their pleasure to renew, or to be paid off. He was happy to say that practically the whole amount had been renewed; and the sums that required to be paid off had been replaced by other applications. The first application for the balance had already come in; and he hoped that, within the specified time (Dec. 14), the entire amount would be applied for by the shareholders. He had thought it well to explain to the shareholders that the money was really required for working capital and to keep the works up to the requirements of the times.

This concluded the proceedings.

IMPROVEMENT SCHEME FOR THE BANGOR (IRELAND) GAS-WORKS.

A Special Meeting of the Bangor (Ireland) District Council was held on the 26th ult. to consider the present condition of the gas-works. A report, prepared by Mr. S. B. Langlands, of Coleraine, with reference to the improvement of the works, was read. It contained two alternative plans, the second being a little cheaper than the first; but Mr. Langlands recommended plan No. 1. The works at the present time, he stated, were in a bad condition, and gas could be made neither economically nor well, so it was desirable to have an improvement made at once. The coal-store, it was remarked, was ample for their present purposes. The retort-beds were totally inadequate to meet the requirements of the town; and the greatest difficulty was experienced in maintaining the gas supply. The retort-house, too, was faulty in construction, badly lit, and too narrow. The chimney also was only in fair condition. Mr. Langlands suggested that a new octagonal chimney stack should be erected; that the old coal-store should be taken down, and a new retort-house built in its stead, adjacent to the new coal-store. The present condensers were incapable of doing their work; and the exhauster would require to be taken out, and a new steam-driven one fitted. The scrubbers and purifiers would also need replacement. The mains throughout the works would, of necessity, require to be re-placed; and Mr. Langlands advised that new ones of a large size should be laid down. In No. 2 plan, the only variation was that, instead of erecting a new retort-house and chimney, an addition should be made to the existing house. The estimated cost of No. 1 plan (including £700 for retorts, £400 for retort-house, and £200 for chimney) was £2757; while the estimated cost of plan No. 2 was £2367—£210 being allowed for an addition to be made to the existing retort-house. Considerable discussion took place, in the course of which the Gas Manager (Mr. R. Gault) declared his general approval of the report. Mr. Bowman asked if the Council would be justified, in view of the present advances in electric lighting, in spending £3000 on improving the gas plant. Mr. Gault, having previously stated that, by the improvements proposed, it might be possible to produce about 1500 cubic feet more gas per ton of coal than at present, Mr. Thomson declared that the profits accruing from this increase would pay the interest and instalment of the necessary loan. A decision on the question was ultimately postponed.

NEWTOWN AND THE PURCHASE OF THE GAS-WORKS.

The Matter to Go to Arbitration.

A Special Meeting of the Newtown District Council was held yesterday week, at which the Gas Committee reported that they had received notice from the Gas Company mentioning £47,000 as the price they were prepared to accept for their undertaking. This, of course, was a sum which the Council could not entertain; and it would now be necessary to give notice to the Company accordingly, and to appoint their Arbitrator. To give effect to the Council's notice to treat, the Committee had secured the services of Messrs. Cash, Stone, and Co., as the Accountants to examine the books of the Company, and of Mr. Charles Hunt, of the Birmingham Corporation Gas-Works, and Mr. Alfred Colson, of the Leicester Corporation Gas-Works, to estimate the value of the concern. The Committee recommended that the Council appoint Mr. W. A. M'Intosh Valon their Arbitrator, and give notice thereof to the Company.

Mr. A. S. Cooke, Chairman of the Gas Committee, moved the adoption of the report. Mr. E. Jones, in opposing, said that the purchase would involve a rate of 5d. to 9d. in the pound annually. Mr. P. W. Jones said he also opposed the scheme. He did not see why they should saddle themselves with the Company's old plant. They had saddled themselves with sufficient rates already, and would have to spend considerably more than their borrowing powers upon the water-works. Mr. Jones failed to see that the town would make any profit out of the gas. There had been a lot of very peculiar work in pushing the matter forward. He would rather sacrifice the £2000 which had been spent than proceed with the purchase. Mr. J. Green supported the adoption of the report. If, he said, the scheme was rejected, there would be £2000 expenses to pay; but if they purchased perhaps there would not be a penny to pay. The Company were paying a dividend of 8 per cent.; and if there was any profit to be made, it ought to go to the rates.

After a long discussion eight voted for the adoption of the report and six against it.

ELECTRIC LIGHTING NOTES.

The Local Government Board have sanctioned the full loan of £34,565 applied for by the Maidstone Town Council for their electric lighting installation.

The Brighouse Town Council last Wednesday discussed at considerable length the advisability of embarking on a proposed scheme of electric lighting calculated to cost about £25,000. The recommendation was approved.

Last Wednesday, Mr. Sandford Fawcett held a Local Government Board inquiry at Heywood, in reference to an application of the Town Council to borrow £17,000 for the purposes of electric lighting and £5438 for a refuse destructor. There was no opposition.

The recent deputation from the Limerick Corporation seems to have produced the desired result, as the Local Government Board, who had previously postponed indefinitely an application for a loan of £22,000 required for carrying out a municipal scheme for electric lighting, have reconsidered their decision; and the Town Clerk received last Thursday an intimation that the loan had been sanctioned.

On Monday evening last week, there was an alarming incident at the Blackburn Corporation Electricity Works. Owing to a short circuit somewhere in the town, one of the engines at the works became overloaded, and this was followed by a serious accident in the engine-room; but fortunately no one was injured. Tramway traffic throughout the borough was temporarily suspended; and the centre of the town was plunged in almost complete darkness.

"Satisfactory progress" is reported by the Chairman of the Electric Lighting Committee of the Doncaster Town Council. He says they have now 8300 lamps connected; but he complains that some people will persist in labouring under the "fallacy" that electricity is more expensive than gas at the charge of 5d. per unit. It is so easy to call truths by other names. We do not know the exact price of gas at Doncaster at the moment, but it used to be, before the rise in the price of coal, 2s. 6d. per 1000 cubic feet.

Having protested in vain against the indifferent lighting of the town, the Chelmsford Town Council recently astonished the Electric Light Company by refusing to sign a cheque for last quarter's account. Mr. F. Reeves, the Secretary, has again written to excuse the Company. He says there has been some trouble with the arc lamps, in consequence of breakdowns in insulation—matters over which the Company cannot exercise control; but every effort is made to ensure that the insulation is perfect. He also promises that the Company will do their very utmost in the future to light the town properly. But promises of reformation have frequently been made; and, sad to say, have been just as frequently broken.

The Leeds Corporation Electric Lighting Committee have decided to recommend the Council to accept tenders, amounting to £72,943, for extending the existing electricity works at Aire Street on the adjacent Britannia Mills site, which has already been cleared and prepared for such development. The Committee propose the provision of a third 600-kilowatt plant on the two-phase system; also the laying of mains with a view to supplying electricity for power and lighting in the southern and western districts of Leeds. Before very long, therefore, it seems probable that not only the shops and industrial premises of Holbech, Wortley, and Armley, but far-removed residential quarters of this part of Leeds will be supplied with current.

Readers of the "Journal" are perfectly well aware that the electric lighting arrangements of the Paris Exhibition were incomplete for some time after the opening of that great undertaking. This fact, coupled with the high rents charged to the owners of shows and bars, almost led to a general strike. The proprietors were, however, mollified by the promise that their grievances should be arbitrated upon. The decision of the arbitrators was given on Monday last week. They consider that the delay in the completion of the Exhibition and in the supply of electric light constitutes a title to compensation. One claim was for 292,000 frs.; and in this case 80,000 frs. have been awarded. The remaining awards range from 70,000 frs. down to 5000 frs.; six claims being rejected.

At West Hartlepool, last Thursday, Colonel Durnford, one of the Local Government Board Inspectors, held an inquiry with respect to an application by the Town Council to borrow £24,260, of which £19,625 is required for electric lighting purposes. The Town Clerk (Mr. Higson Simpson) explained that a considerable proportion of the excess expenditure upon the original estimate for the electric light undertaking was due to the rise in the price of materials between the time the estimate was given and the letting of the contract. The buildings cost £3600 more than the estimate, £7112 was required for extension of mains, and £2707 for probable improvements during the next twelve months. The Inspector observed that the increase over the estimates for buildings, &c., was very large, being more than 50 per cent. The remaining expenditure having been explained, the inquiry concluded.

In the "Journal" for the 13th ult., we announced that the Electric Light Committee of the Ryde Corporation brought up a report, at the meeting on the previous Friday, recommending that they should be empowered to instruct Messrs. Kincaid, Waller, and Manville to procure tenders for carrying out the electrical works according to plans already received from them, and approved by the Local Government Board. The recommendation was not adopted, and the report was referred back to the Committee. At the meeting of the Corporation on Monday last week, Mr. Hansford brought up the report again, and gave a retrospect of the electric lighting question; concluding by moving that the resolution previously submitted should not be adopted. After considerable discussion, this was carried by 18 votes to 3. Subsequently, the Committee were authorized to endeavour to obtain the sanction of the Board of Trade to the transfer of the Provisional Order of 1899, and to an extension of the time for carrying it out.

The notion was at one time current (observes the "Lancet") that an electric installation secured the householder from many of the risks attendant upon a gas installation or the use of oil and candles. It is very doubtful if this is so, at any rate under the present methods of laying cables and of "wiring" our houses. Recent events which have come to our knowledge call very seriously for a fresh inquiry as to the methods adopted for supplying electricity to our houses. It is common knowledge now that an otherwise innocent current—that is, one of low voltage—

may, through certain defects, become an exceedingly dangerous current of enormous voltage. We might as well allow a large water-main in communication with a reservoir containing millions of gallons of water at a high level to be erected over our heads without providing proper means of preventing leakage. The Board of Trade should be approached with a view to enforcing by very definite regulations a safer method of installation of domestic electric lighting than appears to be in vogue now.

A special meeting of the Aberdare District Council was held a few days ago to consider the scheme of the Aberdare Electric Lighting Company, Limited, for the lighting of the town. A letter from Mr. S. Lloyd, the Secretary of the Aberdare Labour and Trades Council, asked the Council to withhold their assent to the scheme, and procure lighting powers themselves. The Electric Lighting Company wrote saying that if the Council assented to the scheme and subsequently decided within six months to undertake the lighting of the town themselves, the Company would undertake to hand over their powers to the Council on the payment of out-of-pocket expenses alone. The Surveyor reported that the maximum charge which the Company were enabled to make would be 13s. 4d. for 20 units, and 8d. per unit after; being equal to gas at 3s. 4d. per 1000 cubic feet. Alderman J. W. Evans, the Solicitor to the promoters, said that if the Council really purposed taking the matter up, he was prepared, on behalf of the Company, to hand them the Provisional Order at any time within the next six months—or he might say twelve months—without one penny piece of profit. It was too late for the Council to go in for powers next session; and by obtaining the Company's Order, they would be a year in advance. He wished them to remember that a charge equivalent to 3s. 4d. per 1000 cubic feet of gas was the maximum. The Company might be able to supply electricity at a charge equal to 1s. 8d. per 1000 feet. Mr. John Howell said he, too, was one of the promoters. He had advocated a scheme on municipal lines by the Council; but they had not seen their way to proceed with it. He did not wish to make a penny pr fit out of the scheme. Let the C uncil take it up, and he would be quite satisfied. Mr. Lewis N. Williams pointed out that the capital of the Company was only £2000. It seemed as if the promoters only wanted to get their scheme sanctioned, and clear a big profit on it. He moved that the assent of the Council be refused. Mr. T. Lewis seconded the motion; urging the Council to arrange for a scheme of their own. After further discussion, assent was refused. Mr. J. Howell then gave notice to move at the next meeting that the Council undertake an electric lighting scheme.

Increase of Incandescent Gas Lighting in the City of London.—At the last meeting of the Corporation of the City of London, it was decided, on the recommendation of the Streets Committee, to further extend the incandescent gas system of street lighting.

Greenall's "Positive" Meter Syndicate, Limited, has been registered with a capital of £20,000, in £1 shares, to adopt an agreement with J. Greenall, and to carry on the business of manufacturers and suppliers of meters and other apparatus for measuring gas, water, oil, electricity, and other fluids or forms of energy.

LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

Proposed Deputation to the Local Government Board.

At the Meeting of the London County Council to-day, the Water Committee will present the following report, and ask for its consideration as a matter of urgency: "At the meeting of the Council on the 13th of November, when our report recommending the introduction of a Bill for the purchase of the undertakings of the Metropolitan Water Companies was under consideration, suggestions were made that it might be desirable for a deputation from the Council to approach the Government with a view to seeking information as to the steps, if any, which they propose to take for giving effect to the recommendations contained in the report of the Royal Commission on Water Supply, which was appointed in 1897. Believing that it would be the desire of the Council that we should direct our attention to this matter, we have given it our careful consideration; and we have come to the conclusion that it will be advantageous for a deputation to wait upon the President of the Local Government Board at the earliest possible moment, and that such deputation should consist of the members of the Water and Parliamentary Committees. We also propose that the deputation should avail themselves of the opportunity to urge upon the President of the Board the desirability of their making a daily, instead of, as at present, a monthly examination of the water supplied to London by the Water Companies; and further that the President should be asked whether he will reconsider the determination of the Board not to supply the Council with copies of Orders issued by the Board under the Metropolis Water Act, 1899, sanctioning schemes and the raising of the necessary capital for effecting intercommunication between the works of the Companies. The Council will remember that we have dealt with both these subjects in previous reports—viz., on Oct. 31, 1899, and Nov. 6 of the present year. We recommend—'That the President of the Local Government Board be asked to receive a deputation at an early date on the subject of the water supply of the County of London, and that the members of the Water and Parliamentary Committees do form such deputation.'"

BIRMINGHAM CORPORATION WATER SUPPLY.

Progress of the Elan Valley Works.

At to-day's Meeting of the Birmingham City Council, the Water Committee will report that a further investment to the extent of £26,836 18s. has been made on account of sinking fund in the purchase of annuities for redemption. Of this, £955 was included in the accounts to March 31, and the remainder, £25,881, has been invested since that date. The quantity of water distributed during the half year to Sept. 30 was less than that for the corresponding period of 1899, having averaged 18·2 million gallons a day against 18·7 million gallons last year. Seeing that the number of houses in supply has increased in the interval, and

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1385.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct 12	10½	Alliance & Dublin 10 p. c.	19—20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd. . . .	5—5½	..	6 7 3
100,000	10	,,	7½	Do. 7 p. c.	13—14	..	5 7 2	500,000	100	Dec. 1	6	People's Gas of Chicago 2nd Mtg. Bonds	102—106*	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb.	101—103	..	4 17 1								
210,000	5	Nov. 14	6	Bombay, Ltd. . . .	6—6¼*	..	4 12 4	851,070	10	Oct. 12	7	River Plate Ord. . . .	10—10½	..	6 13
40,000	5	,,	6	Do. New, £4 paid	4—4¼*	..	5 6 8	250,000	Stk.	June 28	4	Do. 4 p. c. Deb.	100—102	..	3 18 5
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245—255	..	4 14 1	250,000	10	Sept. 28	8	San Paulo, Ltd. . . .	11—12	..	6 13 4
270,000	,,	,,	9	Do. New . . .	177—182	..	4 18 11	135,000	Stk.	Sept. 14	10	Sheffield A.	234—239	..	4 3 8
50,000	,,	,,	5	Do. 5 p. c. Pref.	137—142	..	3 10 5	209,700	,,	,,	10	Do. B.	234—239	..	4 3 8
159,375	,,	June 14	4	Do. 4 p. c. Deb.	116—120	..	3 6 8	447,427	,,	,,	10	Do. C.	232—237	..	4 4 5
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220—230	..	4 6 11	5,641,885	Stk.	Aug. 15	5½	South Metrop., 4 p.c. Ord.	128—131	+1	4 1 5
926,320	,,	,,	7	Do. A. Ord. Stk.	145—155	..	4 10 4	1,520,000	,,	July 12	3	Do. 3 p. c. Deb. . .	95—98	+1	3 1 3
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p. c. max.	117—118	..	4 4 9	380,940	Stk.	Nov. 14	5	Southampton Ord. . .	107—112*	..	4 9 3
420,000	20	Sept. 28	10	British	39—41	+1	4 17 7	70,825	,,	July 12	4	Do. 4 p.c. Deb.	117—122	..	3 5 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c.	24—26	..	4 12 4	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c. and B. 3½ p.c.	113—117	..	5 2 7
79,000	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8	250,520	,,	,,	4½		80—85	..	5 5 11
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8—8½	..	7 1 2	61,550	,,	June 14	4	Edmonton 4 p. c. Deb.	111—115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p. c. Deb.	98—100	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7—8	..	6 5 0
150,000	20	July 12	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98—102	..	4 18 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	13¾—14½	..	5 10 4								
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55*	..	5 9 1								
550,000	Stk.	Oct 12	12½	Commercial Old Stock	270—275	..	4 12 8								
236,425	,,	,,	9½*	Do. New do.	200—210	..	4 12 10								
288,237	,,	June 14	4½	Do. 4½ p.c. Deb.	133—138	..	3 5 8								
800,000	Stk.	May 31	9	Continental Union, Ltd.	175—180	..	5 0 0					WATER COMPANIES.			
200,000	,,	,,	7	Do. 7 p. c. Pref.	168—173	..	4 0 11	780,404	Stk.	June 28	11	Chelsea, Ord.	307—312	..	3 10 6
51,600	Stk.	—	14	Croydon A 10 p. c. . .	—	..	—	150,000	,,	,,	5	Do. 5 p. c. Pref. .	157—162	..	3 1 9
178,400	,,	—	11	Do. B 7 p. c. . .	—	..	—	160,000	,,	,,	4½	Do. 4½ p. c. Pref. 75	143—148	..	3 0 10
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	117—122	..	4 6 1	175,785	,,	Sept. 28	4½	Do. 4½ p. c. Deb. .	143—148	..	3 0 10
60,000	,,	,,	5	Do. 5 p. c. Pref. .	130—135	..	3 14 1	1,720,560	Stk.	Oct. 12	7	East London, Ord. . .	198—198	..	3 10 8
486,090	10	July 27	11	European, Ltd. . . .	19—20	..	5 10 0	654,740	,,	June 14	4½	Do. 4½ p. c. Deb. .	147—152	..	2 19 3
354,060	10	,,	11	Do. £7 10s. paid .	13½—14½	−½	5 13 9	797,687	,,	,,	3	Do. 3 p. c. Deb. .	99—101	+1	2 19 5
14,993,075	Stk.	Aug. 15	4 4/5	Gas-light and Coke 4 p. c. Ord.	97—99	..	4 8 10	700,000	50	June 14	8†	Grand Junction 10 p. c. max.	110—113	..	3 10 10
2,600,000	,,	,,	3½	3½ p. c. max.	92—94	..	3 14 6	310,000	Stk.	Sept. 28	4	4 p. c. Deb. .	130—135	..	2 19 3
3,799,735	,,	,,	4	4 p. c. Con. Pref.	115—118	..	3 7 10	708,000	Stk.	Aug. 30	14	Kent	300—305	..	4 11 10
3,993,975	,,	June 14	3	3 p. c. Con. Deb.	95—97	+1	3 1 10	160,000	,,	,,	7	Do. New, 7 p. c. max.	200—210	..	3 6 8
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13—14*	..	5 14 4	1,043,800	100	June 28	10½	Lambeth, 10 p. c. max.	295—300	..	3 10 0
3,800,000	Stk.	Nov. 14	10	Imperial Continental .	202—207*	..	4 16 7	406,200	100	,,	8	Do. 7½ p. c. max.	207—212	..	3 15 6
473,600	Stk.	Aug. 15	3½	Do. 3½ p. c. Deb. Red.	100—102	..	3 8 8	850,000	Stk.	Sept. 28	4	Do. 4 p. c. Deb. .	127—130	..	3 1 7
75,000	5	June 14	6	Malta & Medn., Ltd. .	4¾—5½	..	5 14 3	500,000	100	Aug. 15	14	New River, New Shares	415—420	+2	3 6 8
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	105—108	..	4 12 7	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128—133	..	3 0 2
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	104—106	..	4 4 11	902,300	Stk.	June 14	7½	South-wark and Ord. . . .	200—205	−3	3 13 2
541,920	20	Nov. 14	3½	Monte Video, Ltd. . .	9½—10½*	−½	6 13 4	126,500	100	,,	7½		188—193	..	3 17 9
667,946	Stk.	Aug. 30	9½	Newc'tle & Gatesh'd Con.	210—215	..	4 6 1	489,200	Stk.	,,	5	7½ p. c. max. 5 p. c. Pref.	155—160	..	3 2 6
299,855	Stk.	June 28	3½	Do. 3½ p. c. Deb. .	104—107	..	3 5 5	1,019,585	,,	Oct. 12	4	Vauxhall 4 p. c. A Deb.	128—133	..	3 0 2
160,000	5	Nov. 29	8	Oriental, Ltd. . . .	7—7¾*	+¼	5 6 8	1,155,066	Stk.	June 14	10	West Middlesex . . .	280—290	+2½	3 9 0
135,000	5	,,	8	Do. New, £4 10s. pd.	5¾—6¼*	+¼	5 15 3	200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	140—145	..	3 2 1
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1½*	+¼	4 11 6	200,000	,,	Sept. 14	8	Do. 8 p. c. Deb .	97—99	..	3 0 7
					*Ex. div.								*Ex div.		

† Next dividend will be at this rate.

that the consumption for trade purposes was also somewhat greater, the net domestic consumption per head per day is seen to have been considerably reduced. This result is doubtless due to the fact that the weather during the summer has been favourable to the operations of the department, there having been no extended periods of drought as was the case last year. The highest consumption recorded on any day during the summer was 23·5 million gallons, against a maximum of 23·2 million gallons last year—that is, above a quarter-of-a-million gallons excess. Several additional purchases of land in connection with the Welsh waterworks will be reported, making the total acquirement by the Corporation to date as follows: Freeholds, 10,323 acres; common and exclusive rights, 24,555 acres; mineral or mining rights, 5879 acres; and manorial rights, 36,903 acres.

In reference to the progress of the Elan Valley works, the Committee will report that the weather during the summer having been favourable for the execution of the works, a good advance has been made at all points. At Caban Coch, the middle portion of the dam has been built up to the level to which the work had been previously brought above the culverts on the river banks; and the dam is now practically completed up to 30 feet above the river right across the valley. At Careg-ddu very little remains to be done except to complete the upper masonry of the bridge and the parapets. At Pen-y-Gareg the wall is built up to 915 Ordnance datum, or 30 feet below crest level; and at Craig-Goch, to 1025 Ordnance datum, or 15 feet below the crest. Driving has been going on night and day at the Dol-y-Mynach tunnel; and about three-tenths of the total length is now driven. The excavation has been commenced for the foundation of the Dol-y-Mynach dam. A portion of the Foel tunnel has been partially lined; and a good deal of the Elan conduit being carried out by administration is now complete.

Regarding the aqueduct works, the Committee report that on Contract No. 3 (Elan to Dolau—Messrs. John Aird and Sons), the work is now practically complete; and the twelve months' term of maintenance commenced on Nov. 1. On Contracts 2, 7, 11, and 12 (Dolau to Hagley—Messrs. Morrison and Mason), the delays on which have given the Committee some anxiety, fair progress is now being made, although in the case of the last two it is not so rapid as could be wished. The progress on Mr. Kellett's contract, No. 13 (Hagley to Frankley), has been fairly satisfactory. At the reservoir and filters at Frankley, a considerable amount of work has been done. Contract No. 16 (pumping machinery—Messrs. Glenfield and Kennedy, Limited) is well in hand. On Contract No. 15 (Messrs. John Aird and Sons), for supplying and laying a large portion of the mains from Frankley to the city, &c, a good deal of the work has been done.

"America is beginning to supply Europe with coal on a large scale," says a telegram from New York to the "Daily Express." It continues: "France has ordered 450,000 tons from a Pittsburg Company, and the order will be shipped to Nantes by way of Baltimore. Other big orders are coming from Italy and Austria. Day and night vessels are being loaded for abroad at the piers in Baltimore."

STOCKPORT CORPORATION WATER SCHEME.

The Decision of the Ratepayers Postponed.

A Special Meeting of the Council of the county borough of Stockport was held last Tuesday to authorize an application to Parliament for a Bill empowering the Corporation to construct reservoirs, conduits, and other works for impounding, using, and distributing within the limits of water supply of the Corporation the waters of the Rivers Sett and Kinder and their tributaries, and other waters to be intercepted or taken by the intended works. Alderman Lees, Chairman of the Water Committee, moved the necessary resolution. He said that, when the Corporation acquired the water undertaking recently, it was calculated that their sources of supply were sufficient for 160,000 persons. Mr. Mansergh, however, estimated that the population in the water area would reach this number in the course of the next eight years; and therefore as no part of the proposed works could be completed so as to supply them with water under eight years, it was quite time they made preparation for increasing the supply to meet the demand that would exist eight years hence. To give this supply the Kinder and the Sett were considered the best sources in the district. The estimated cost was as follows: Cost of works—Kinder, £389,370; Sett, £198,310; Hollingworth, £98,030; total, £685,710. It was not intended to proceed with all these works at once. They would be taken in three sections extending over about 26 years. It was proposed to obtain borrowing powers to purchase the gathering-ground if they should require it; and this, with the extension of the district mains and other matters, would cost £134,000. The Borough Treasurer (Mr. H. Grundy) estimated that there would be a deficiency of £23,270 during the first eleven years, and a 1d. rate-in-aid, in addition to the 1½d. rate already laid, would be sufficient to meet this deficiency in nine years. Whatever money was provided out of the rates to meet this deficiency would have the first claim for repayment when the profit period arrived; so that during the next fifteen years this money would be repaid. When it was decided at the ratepayers' meeting to acquire the water-works, it was estimated there would be a deficiency of £1325 on the first year; but, as a matter of fact, the income had exceeded the expenditure by several hundred pounds, so that it was more than likely they would not be called upon for even the small amount of additional rating estimated. Alderman Turner seconded the motion. In the discussion which followed, Mr. Mansergh was requested to state his opinion. He said the Kinder and the Sett were the proper sources of supply for Stockport. The district about Stockport was going to grow enormously, and the best way of fostering such growth was to give an ample supply of first-class water. Unless provision was made at once for increasing the supply, they would certainly have serious trouble; and seeing they had the estimate of their Accountant that such supply could be obtained at the cost of a penny rate for a few years, he could not conceive why there should be any hesitation. It would be the supremest folly to refrain from going to Parliament for the Bill this year. The discussion was continued, and two amendments were introduced; but subsequently, the original motion was adopted by 37 to 6. The

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	WINNIPEG, MAN.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.,	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHEDE (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

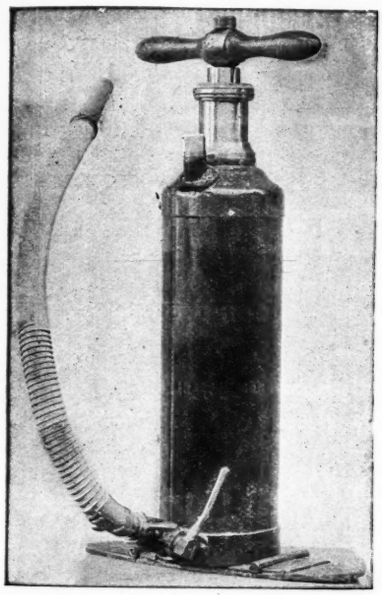
Complete Gas-Works at NELSON, BRITISH COLUMBIA.

IMPROVED SERVICE CLEANSER

FOR SPECIALLY DEALING WITH

NAPHTHALENE.

(HERBERT JONES' PATENT, No. 14,634.)



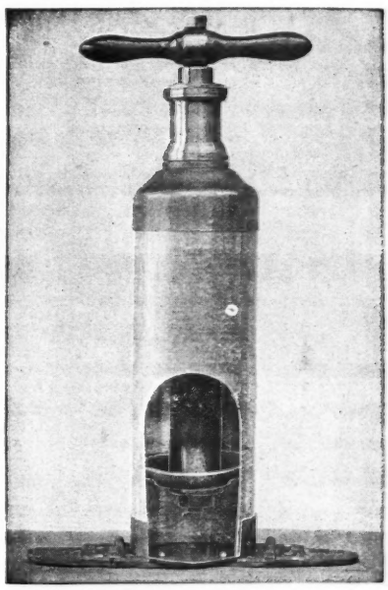
Trade List

£3 5s.

Net.

2½ per cent.

Cash Monthly.



Advantages.

This Cleanser is thoroughly effective in removing Stoppages of all kinds, but in practice has been found to be particularly so in cases where Services are choked with Naphthalene.

It is less expensive to Companies, as it overcomes the necessity for repeated operations; and further it reduces the inconvenience to Consumers to a minimum by more thoroughly cleansing the pipes than is done with simply an Air-Blast.

It can, however, be used as an ordinary force-pump, without alteration, by simply omitting the charge.

It is light and compact.

INSTRUCTIONS FOR USE.

Unscrew the plug on the shoulder of the Pump, and pour in a charge of (say) from ¼ to ½ pint of Petroleum Spirit 680-700. Replace the plug, and proceed as with an ordinary Service Cleanser.

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GAS-METER MANUFACTURERS,

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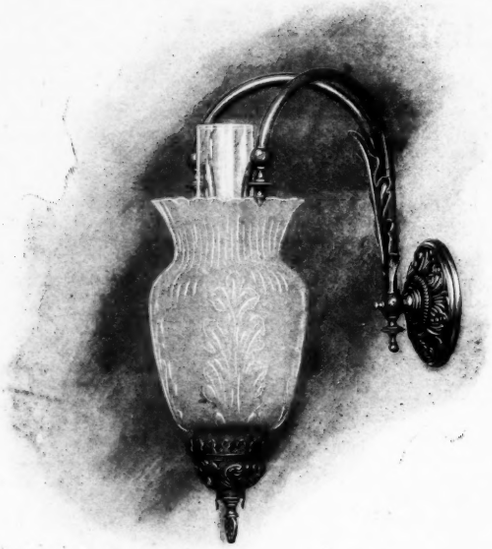

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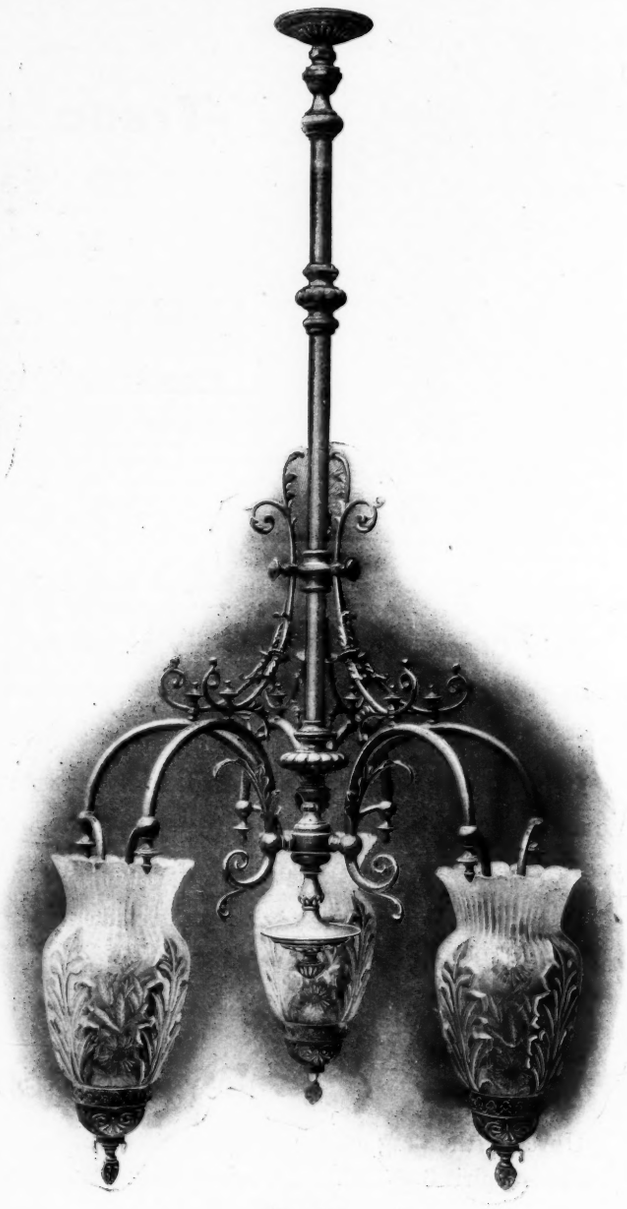

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Mayor (Mr. Albert Johnson) afterwards presided over a representative meeting of owners and occupiers, and proposed a resolution in favour of the Corporation scheme. After a lively discussion, the Mayor accepted an amendment to adjourn the meeting for a fortnight.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A letter signed "An Elderly Citizen" was published in the "Scotsman" on Tuesday, under the heading of "The Edinburgh Gas Supply." The burden of the communication is the policy of the Gas Commissioners in having reduced the illuminating power of the gas. It says: "The inferiority of the light is conspicuous, and is extremely inconvenient when we use it for reading or writing, or for other work. Alas! we are constantly reminded that we are in the hands, not of an individual or a joint-stock company, whose interests would lead them to satisfy us, but of nominees of the Town Council, who probably imagine that a nominal, though not a real, economy does them some credit. I do not know whether the object is to drive us from the use of gas, and compel us to use electric light. In my house I use both; but I confess that the failure of the Town Council and its nominees in the matter of gas, makes me hesitate to trust them as the providers of electric light. . . . . One does not want extravagance; but there is no extravagance in paying a higher price for a better article. As I have already said, we can economize for ourselves." Now, there can be no complaint as regards the tone of this letter. It contains no insinuation that an attempt is being made to deceive the public, but is an expostulation against the deliberate lowering of the illuminating power. The writer takes up the attitude which used to be held by nearly all suppliers of gas—that a higher illuminating power is cheaper in the end—but out of which nearly everyone has now grown. He is thus behind the age. It is not at all to be wondered at that someone outside the ranks of the gas industry, and unacquainted with the evolution which has been going on inside, should, when changes come, preach the doctrines he was brought up in. Nothing more natural. As to the facts upon this subject, there is little to be said. In the cloud-laden atmosphere of the past two months all lights have paled, not even excepting that of the sun. But, descending to the particular, I observe from the latest return of the Commissioners that during the month of October the illuminating power of the gas supplied from the Edinburgh works was of 24·05-candle power, as compared with 25·77 candles in October of last year; while the gas from the Leith works was of 22·91-candle power, as compared with 25·13 candles. The Commissioners aim at supplying gas of from 24 to 26 candle power. It will therefore be seen that they succeed in doing this in Edinburgh, but not in Leith. Their failure in Leith they quite acknowledge, on account of the condition of the works. If then, the writer of this letter should happen to live in the district supplied from the Leith works, the gas he would be getting would not be so good as (it might be) the gas which his neighbour across the street was obtaining from Edinburgh. The correspondence has not gone farther than the one letter—as, indeed, there is every reason why it should not, because at present Mr. Herring has before him the whole subject of the illuminating power of the gas supplied. When his report is published, it will be an authoritative pronouncement on the subject. Various opinions may be expected then, and I daresay will not be unwelcome. The difference between discussion now and then lies in the fact that then there will be an intelligent lead, whereas now there is not, as is illustrated by this letter.

The Edinburgh and Leith Gas Commissioners held their first meeting on Tuesday, after being reconstructed, when the new members appointed by the Corporation took the declaration of trust which is required by statute. There was little other business before the meeting. Mr. Kinloch Anderson was re-appointed Convener of the Works Committee, with Mr. David Purves as Sub-Convener. The latter is a new appointment, and is made with a view to relieving Mr. Anderson of as much work as possible, on account of the state of his health, upon the improvement in which he was congratulated. Mr. Purves acted as Convener during Mr. Anderson's absence. The convenership of the Finance and Law Committee was filled up by the re-appointment of Bailie Manclark, of Leith. The report of Mr. W. R. Herring, the Engineer, upon the output of gas during October, showed an increase of 1,839,000 cubic feet over the same month of last year. Since May 16, there has been an increase of 19,044,000 cubic feet, which is equal to 3·23 per cent. The increase is not nearly so large as it has been in recent years; but I perceive that there are many more houses unoccupied than formerly, which would very seriously affect the consumption of gas.

The treatment of the subject of electric lighting in Edinburgh is an index to, among other things, the enormous wealth of the country. The total amount authorized to be borrowed for the purposes of the undertaking is now £700,000. The entire population is a little over 300,000. That is to say that more than £2 is raised, or will soon be, for every man, woman, and child in the community. Taking the average household as five, there is a capital outlay of from £10 to £12 in respect of every dwelling-house in the city. The whole of this expenditure has taken place within seven years. No one can say that, had it not been incurred, the people would have been one whit the worse off than they are now. Why, then, the outlay? Simply because there is a mine of wealth which skilful people have tapped. There has been much complaint at the rise in the price of coal and other commodities, which are necessaries of life; but here is a large expenditure upon what is not a necessity, and yet it goes altogether unconsidered. Had the community been left to themselves, this outlay would not have been made; for the Corporation only applied for a Provisional Order when they recognized that it was their only course for keeping out speculative companies, and almost allowed the Order to lapse before they exercised their powers under it. Yet clever people have succeeded in getting the community, through their municipal representatives, to speculate to the amount of £700,000, and that not only without grumbling, but the reverse; for do we not hear, repeatedly, of the glorious progress of the electric light undertaking in Edinburgh? A community voluntarily

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imposing an annual charge on themselves of over £30,000—equal to 3d. per pound on the rates—is not the view which is usually presented; but it is nevertheless the true way of looking at it. Sufficient thought, I fear, is not given to the matter in this light. Suppose a time of distress, and a general giving up of electric lighting, on account of its extra cost, who would care to propose an addition to the police rate in order to meet the obligations of the electric light undertaking? Yet the probability of this requiring to be done is not very remote.

The Gas and Water Committee of the Aberdeen Town Council have not been long in replying to the "demand," as it is put, of the employees in the gas-works for new conditions of labour—chiefly increases of pay. It was on Nov. 19 that the Scottish Secretary of the Gas Workers' Union communicated the demand; and on Nov. 28 the Committee considered a report on the subject which had been drawn up in the interval by Mr. A. Smith, the Engineer and Manager. Briefly put, Mr. Smith's report was to the effect that the changes desired would represent an additional expenditure on gas manufacture of £3306 per annum, or equal to 1½d. per 1000 cubic feet of gas sold. The wages paid to gas stokers in Scotland range from 4s. to 5s. 4d. per eight-hour shift; while in Aberdeen they are paid 4s. 6d. No gas-works of any size in Scotland have entirely abolished Sunday labour. Some have been obliged to shut down on Sundays for a few hours, but only because of deficient storage capacity. This was tried in Aberdeen in 1888, but was found to be unsatisfactory, both to the undertaking and to the workmen; and at the request of the workmen themselves, the attempt was abandoned. Sunday labour, however, has been reduced to the lowest possible point. After considering the report, the Committee decided to recommend the Town Council to refuse the demands, in view of the present depressed state of the labour market, and the large number of men going idle. The Committee could do nothing else, if they were to be loyal to the undertaking which they manage. There is a long letter to-day in the Aberdeen newspapers, by one who does not give his name, in which a list is given of the wages paid to the various classes of men in different gas-works in Scotland, with a view to pointing out that in Aberdeen the wages are lower than in other places. Upon face value they may be; but wages in Aberdeen cannot be compared with those in Khartoum, and neither can they with the wages paid in southern towns. As a matter of fact, living in Aberdeen is much cheaper than it is in any of the larger towns; and to give the gas workers there the same wages as in the other places, would be to present them with a premium out of the pockets of their fellow citizens. I am still of the opinion expressed in my "Notes" of the 20th ult.—that the reason why Aberdeen has been selected for exceptional treatment at this time by the Gas Workers' Union, is not on account of any discontent among the workmen with regard to their pay, but because there is a strong socialistic element in the Town Council, from whom they expect support.

At a meeting of the Glasgow Corporation last Monday, a Sub-Committee of the Watching and Lighting Committee recommended that the Great Western Road, from Kelvin Bridge to the car terminus, be lighted by incandescent gas-lamps, and that each lamp be provided with two burners, except at the corners of streets, where three burners be fitted to each lamp. At a subsequent meeting of the Watching and Lighting Committee, Mr. Steven, seconded by Mr. Richard Browne, moved the approval of the minute. Mr. Shaw Maxwell, seconded by Mr. R. S. Brown, moved as an amendment that the minute be not approved of, but that, in lieu of the incandescent gas lighting recommended, the poles erected by the Tramways Department in the centre of the part of Great Western Road in question be, if retained, lit by electric light. On a division, there voted for the motion six members, and for the amendment seven. The amendment was declared carried; and the Committee agreed to recommend in terms thereof. Bailie Cleland, at the Corporation meeting, asked that the matter be remitted back, with powers to confer generally with the Electricity and the Tramway Committees. Mr. R. M. Mitchell seconded, and this was agreed to.

It is reported that Mr. W. Foulis, the Gas Engineer to the Corporation of Glasgow, and Mr. A. Wilson, the Manager of the Dawsholm works of the Corporation, are making extensive and important experiments in lighting by incandescent gas-burners at Dawsholm. About thirty different lamps, and various makes of mantles, are being employed. It is not improbable that, as the result of the experiments, a large portion of the International Exhibition in Glasgow next year will be lighted by incandescent gas.

To the road-roller is attributed a failure last Saturday of the gas supply in the town of Alyth. It was discovered in the neighbourhood of the gas-works that the main was full of water. A road-roller had been working there a day or two before. The belief is that it had fractured both the gas-main and a water-pipe. The town was in darkness all the evening, except for such improvised lights as could be procured. About 2 o'clock on Sunday morning the fracture in the main was repaired, and the gas supply restored.

On Wednesday Lord Provost Macgregor, of Perth, turned on the water to a new reservoir at Muirhall, which is to serve the higher parts of the city and the Scone district. The reservoir holds 2 million gallons of water; and its elevation is 400 feet above Ordnance datum.

The First Division of the Court of Session, on Tuesday, held that the Edinburgh and District Water Trustees had a statutory right of support for their Crawley water-pipe from the Clippens Oil Company, and interdicted that Company from working their minerals in such a way as to injure the pipe. This is the end, so far as Edinburgh is concerned, of the main action in a protracted and bitterly fought litigation. Their Lordships proceeded on the view that the landowners through whose lands the pipe was laid, under the Water Act of 1819, must be held to have obtained all the compensation they were entitled to; this compensation including the reservation of the minerals which are now forbidden to be worked. The counter action of the Company contains a claim for £137,000 as damage for stoppage of work. It is the expectation that the action will now fall. The other questions in dispute between the two bodies are of much less importance.

The Directors of the Welsbach Incandescent Gas-Light Company announce that no interim dividend will be paid on the preference stock.

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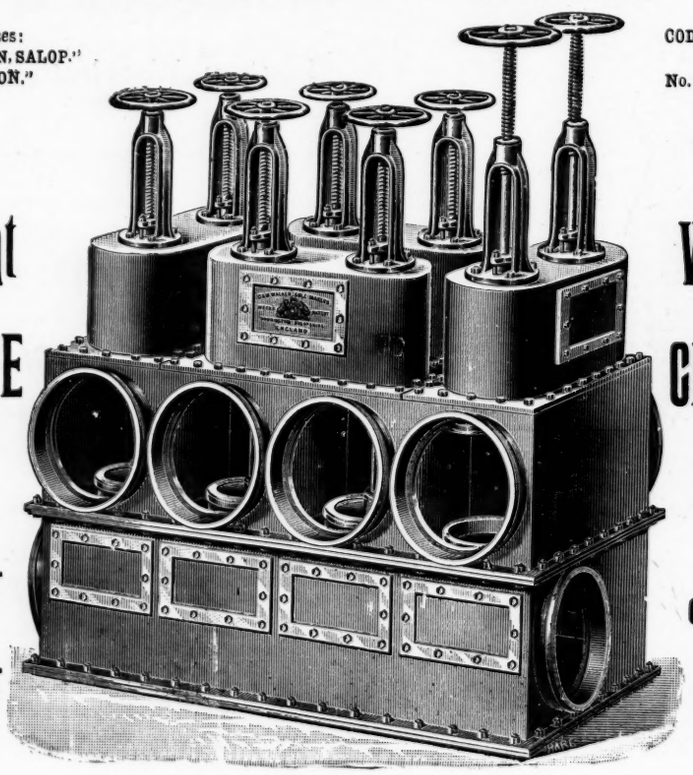

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 1.

Sulphate of Ammonia.—The week opened with a quiet market, and business was done at a slight decline. But later the tone became firmer; and at the close the quotations are £10 13s. 9d. to £10 17s. 6d. per ton f.o.b. at the ports. The bulk of the larger makes is being delivered on contracts; but there have been further "covering" requirements, and, although the smaller makes are approaching their maximum, they have not been too much to meet the later demand. Direct inquiry has been mainly for early spring months; but in this position makers have maintained their firm attitude, and buyers have been driven on to December and January at a premium of 2s. 6d. to 5s. per ton on spot prices. London, Beckton terms, is still quoted at £11 7s. 6d. per ton for January forward, and Leith, ordinary terms, £11 7s. 6d. to £11 10s. per ton for January-March or January-April delivery.

Nitrate of Soda is quiet, but steady, at 8s. 3d. to 8s. 6d. per cwt., on spot, for good and refined qualities, respectively.

LONDON, *Dec.* 1.

Tar Products.—A quiet and uneventful market characterizes tar products generally. Carbolic acid is a little more sought after; and better prices are being paid by inland buyers than for exportation. Makers' stocks are low; and there is no reason why this product should languish as it has been doing. Benzols are fairly firm at former rates, although there is considerable difference in value according to the position of the producer, owing to the difficulties and heavy cost of carriage. It is hoped that the better position of aniline will reflect itself on benzol. Toluol is again in better request; but buyers are offering low prices, and, with a fair outlet for solvent naphtha, it is not worth separating at the figures quoted. Creosote is dull; anthracene continues neglected; and pitch is at the moment in an uncertain position, although heavy shipments are being made on former contracts.

Prices are as follows:—Tar, 15s. to 21s. Pitch, east coast, 34s. 6d.; west coast, 31s. 6d. Benzol, 90's, 10½d. to 1s. 0½d.; 50's, 1s. 1½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 1⅞d. Heavy oils, 2⅜d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 85s. Salts, 65s. Anthracene, nominal, "A," 3⅜d.; "B," 2¼d.

Sulphate of Ammonia is not quite so strong; and buyers are holding off in the hope of lower prices. There are, however, interesting inquiries for important business for forward delivery; and with the present improving value of nitrate, sulphate should not realize lower prices. An all-round price of about £10 15s. per ton, less 3½ per cent., at all ports is about to-day's figure.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The month opens with no change in prices for any description of fuel; but, if anything, the tone is perhaps slightly stronger. The better qualities of round coal are beginning to move off rather more freely for house-fire purposes; and although requirements are still below the average for the time of year, stocks do not increase to any material extent, and are much below what are usually held to meet winter demands. Local collieries, however, are very strong at their full list basis, and less disposed to contract forward at very much below current rates. On the other hand, many of the large users are still holding back from contracting, and are still going on from month to month, buying partly cheap lots in the open market, and taking limited deliveries from Lancashire collieries at the current prices. At the pit mouth, quoted rates remain at about 16s. 6d. to 17s. 6d. per ton for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house coal, 12s. 6d. to 13s. for steam and forge coal, and 10s. to 10s. 6d. for best Lancashire slack. Shipping remains quiet, with prices easier; 15s. 3d. to 15s. 6d. per ton being full average figures for ordinary steam coal, delivered at the ports on the Mersey. A weakening tendency is the general feature throughout the coke trade. At a meeting of foundry coke manufacturers held last week, a falling off was reported in the weight of new orders coming forward; and the general opinion was that some reduction in prices would be necessary before long. Nominally they remain at about 28s. to 30s. per ton at the ovens for good qualities. For furnace cokes, the minimum quotation is 15s.; but consumers are declining to renew contracts at this figure, and in some instances the blowing out of furnaces is talked of, unless coke can be obtained at a lower price.

Northern Coal Trade.—The drop in the price of most classes of coal has continued; while orders are still held back, as is usual on a falling market. Best Northumbrian steam coals are now from 14s. 9d. to 15s. per ton f.o.b., second-class steam coals are 9d. per ton lower, and steam smalls are from 7s. 9d. to 8s. The collieries producing these classes of coal are so far fully employed; but they do not seem to have orders very far ahead. In the gas coal trade, there are now very large deliveries on the long contracts. Production is kept up; and thus the heavy contract quantities are steadily shipped, while there is a little gas coal for occasional sales. For the latter, the prices quoted are lower, and vary a good deal—from 14s. to 15s. per ton f.o.b. being the usual quotation. The coke trade is rather steady; and for best coke for export from 22s. to 24s. per ton f.o.b. is quoted. For coke for blast-furnaces, the rate is from 20s. to 21s. Obviously, these lower prices for coke must affect the gas coke trade; but so far the f.o.b. quotation is maintained at from 24s. per ton, though there are contracts running at much lower rates.

Scotch Coal Trade.—The official announcement is that trade is quiet and supplies plentiful; that buyers are holding back, expecting lower prices; but that the feeling now is (among coalowners) that prices have reached the bottom. In face, however, of this inspired announcement, prices still go down. The quotations are: Main 12s. 6d. to 12s. 9d. per ton f.o.b. Glasgow, ell 13s. 6d. to 14s. 6d., and splint 14s. 6d. to 15s. The shipments for the week amounted to 199,284 tons—a decrease of 8304 tons upon the previous week, but an increase of 6405 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,982,761 tons—an increase of 1,958,012 tons upon the same period of last year.

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The Corporation and the County Council and the Price of Gas in London.—At the meeting of the Common Council of the City of London last Thursday, the Streets Committee brought up a report relative to the conference with regard to the gas supply which was held at the Guildhall on the 31st of October (*ante*, p. 1154), submitting the resolutions passed at the conference, and recommending that they be approved, and that the London County Council be informed that the Corporation will be prepared to join them in any action which may be mutually agreed to with a view to protect the interests of London gas consumers in the direction indicated by the resolutions. The report also contained the resolutions passed at the conference held on the 17th of October by the County Council (*ante*, p. 1028). The report, presented by the Chairman (Mr. A. B. Hudson), was adopted.

Rival Water Schemes for North Derbyshire Villages.—Mr. F. H. Tulloch recently held an inquiry into the merits of a proposed scheme of water supply for a number of villages in North Derbyshire, which has been projected by the Bakewell Rural District Council, and for the carrying out of which they have applied to the Local Government Board for authority to raise £17,000. The application was opposed by the Duke of Devonshire, the principal landowner in the district, who has an alternative scheme, prepared by Messrs. G. H. Hill and Sons. After a long inquiry, the Inspector said he was anxious to know exactly what saving would be effected by the adoption of the Duke's scheme; and to ascertain this, he would like the representatives of the parties to go into each other's estimates together, and, after agreeing on a comparative statement, forward it to him in London, signed by them both. The whole matter hung largely upon the question of relative cost. It was agreed to do this.

Leaky Water-Pipes as Land Drains.—In the "Journal" for the 20th ult. we gave a paragraph on the above subject, in which a correspondent of the "Engineer" commented upon the general memorandum lately issued by the Local Government Board "On the Proceedings which are Advisable in Places Attacked or Threatened by Epidemic Disease." The Board, it may be remembered, stated that leaking pipes running full of water with considerable velocity are liable to receive external drainage that may be dangerous, and that the ignorance of this fact has baffled many inquirers as to the cause of the pollution of water. Another correspondent, signing himself "Distribution," expressed the following opinion on the subject: "This is another instance of the ignorance of the Local Government Board, who are engaged in elaborating model rules, hints, and regulations for the guidance of water-works engineers. Many readers of the 'Engineer' will be pleased to know the facts concerning cases of this kind, if any, and what velocity must be attained in practice to make the theory correct. I cannot conceive of an instance in actual practice where this action can take place in the distribution system. The mains are sometimes shut off for repairs; but even then it must be a very large aperture in the pipe to allow of any liquid on the outside of the pipe to be drawn in. When a main is shut down for repairs, it will be remembered that the air from the numerous services fills the pipe, and helps to empty it of water, so there would not be a vacuum formed in the pipe, and the injector-like action could not take place."

An Ill-Advised Strike of Plumbers.—The following recently appeared in the "Financial News": "The *reductio ad absurdum* in the matter of labour disputes appears to have been reached by the plumbers of Stockton and Thornaby-on-Tees. They struck nearly three months ago for an advance of 1d. an hour, and they have decided to resume work on a concession by the masters of ½d. an hour now and another ½d. six months hence. On the new basis, it will take the strikers several years to make up for the loss of wages incurred during the strike period. It is a pity that the people who misled the plumbers cannot be made to foot the bill; but the Labour leader always manages to escape, while his dupes are left to pay the penalty."

Another Water Scare at Chester.—There has been a little renewed consternation at Chester in regard to the condition of the supply of the Water Company; and at last Wednesday's meeting of the City Council, some references were made to the matter. It was remarked by Alderman Churton that the Public Health Committee had requested the citizens to boil the water before drinking it; and he wished to know whether they had anything else to say to comfort the citizens in the matter. Dr. Hamilton (the Deputy-Chairman of the Public Health Committee) said the condition of the water was only a temporary one, and there was no need for unnecessary alarm. There was no doubt that the report on the bacteriological examination of the water was very unsatisfactory; but they must take into account that the previous reports were most satisfactory. The present state of the water was due to some temporary difficulty in connection with the filtering arrangements at the works. The Committee, as a precautionary measure, had advised that all water for drinking purposes should be boiled while investigations were going on as to the cause of the temporary deterioration. The Committee had taken the advice of Professor Boyce, of Liverpool, one of the most eminent authorities on bacteriological examinations. He had analyzed the water; and as a result he coincided with the opinion which had been expressed by Dr. Frankland that there was a considerable amount of pollution in the water, and that such a state of things, if it continued, would be serious. Dr. Stolterfoth said the examination of the water showed that the number of bacteria was excessive; but this did not imply that the excessive bacteria were harmful. Of course the more bacteria there were in the water, the more probable it was that some would do harm; but the large number might be perfectly harmless. There were other speakers, but they did not advance the foregoing information on the subject. The Water Company have stated to a Press representative that they are strongly of opinion that some unaccountable mistake has been made with regard to the sample of water upon which Dr. Frankland's unfavourable report of the water was based, and in this they say they are confirmed by two subsequent analyses. They are taking steps to obtain further scientific opinion, both as regards the quality of the water and the system of filtration. Although the state of the river in the late autumn is naturally less satisfactory than at other seasons, they consider the treatment to which the water is subjected in filtration should be sufficient to remove all impure matter. They further draw attention to the fact that the medical reports regarding the general health of the city are satisfactory.

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Sales of Shares.—Last Wednesday, £2500 of new "A" and "B" stock in the Canterbury Gas and Water Company was sold in £10 lots at from £21 10s. to £22 each. A few £10 shares in the Leatherhead Gas Company have recently realized £12 5s. to £12 10s. apiece.

Buckley and the Gas-Works.—The Buckley District Council have passed a resolution agreeing to purchase the local gas-works for £4250, subject to the proposed works and site being freehold, and to the confirmation of the Local Government Board. According to a report by Messrs. T. Newbigging and Son, the paid-up capital of the Company is £4370, of which £100 has not been expended; and the undertaking is well worth any figure up to £5000.

Newhaven and Seaford Water Company.—At the meeting of this Company last Thursday, the accounts presented showed a profit of £1379 for the year ending the 29th of September last, and the balance available for distribution was £1304. Dividends of £3 per cent. per annum on the original, and £2 2s. per cent. per annum on the additional capital (free of income-tax), were declared. These amounted to £931, and left a balance of £373 to be carried forward.

The Projected New Works of the Portsea Island Gas Company.—We regret to have to correct some inaccuracies in the account supplied by our local reporter as to the proceedings at the recent meeting of the above-named Company at which the shareholders sanctioned the application for a Provisional Order to authorize the purchase of land for the erection of additional works which is noticed in our "Parliamentary Intelligence" to-day. The land in question is situated at Gatcombe, in the parish of Cosham; and it was obtained under very favourable circumstances—the site costing only £5352, and not £8352. The application has been necessitated to a large extent by the augmentation in the number of cookers on hire—6000 of them having been placed within two years; while the prepayment meters have gone up to 5096, as compared with 160 in 1898. The Company are sending out daily an increase of 400,000 cubic feet of gas. It was Mr. A. W. Oke, and not Mr. Richardson, who complimented the Directors on their foresight.

Gas Poisoning Cases in Scotland.—Two cases of gas poisoning were reported last week—one of them involving the loss of two, and probably of three, lives. This occurred at Renton, in Dumbartonshire, between Thursday and Friday. The residents in Back Street had been warned a few days before that there was an escape of gas from the main; and they were advised to keep their windows open a little. On Friday morning a doctor was sent for to attend to a family who were suffering from the inhalation of gas. Three hours afterwards a neighbouring house was observed to be still unopened; and the door was forced. The occupant—a man named Daniel Follan—was found lying on the floor dead. He had evidently been making for the door when he fell down overcome. His sister was in bed also dead; and his wife was unconscious in bed. There were no other occupants in the house. They were all elderly persons. There is no gas supply in the dwelling. The other case was that of a domestic servant at No. 40, Dumbarton Road, Glasgow, who was found in bed unconscious on Thursday morning. A gas-bracket was fractured at a joint.

Aldeburgh Corporation and the Water-Works.—At a meeting of the Aldeburgh Town Council on the 23rd ult.—the Mayor (Mr. G. H. Garrett) presiding—formal sanction was unanimously given to the purchase by the Corporation of the undertaking of the Aldeburgh Water Company, and to the promotion of a Bill to enable them to carry out the project.

Aspatria and District Water Scheme.—A special meeting of the Aspatria District Council was held on the 24th ult., at which a deputation attended on behalf of the Holme Cultram District Council to represent Silloth. Mr. J. Lawson presided. After the situation created by the Wigton Rural Council withdrawing from the scheme had been discussed, it was decided that the two Councils should proceed with the scheme on the following basis: Silloth to pay 11-20ths, say £16,500; and Aspatria 9-20ths, say £13,500—total £30,000. It was also agreed that the water should be allotted in the following proportions: Silloth, 330,000 gallons per day; Aspatria, 270,000 gallons per day—total 600,000 gallons.

Wadebridge Water Supply.—A scheme of water supply which has been carried out by the District Council was formally inaugurated at Wadebridge last week. The water is derived from streams near a place called Tregundles, and is conveyed through four miles of 6-inch mains to Dunveth, a hill overlooking the town, where a reservoir has been constructed. It has a capacity of 220,000 gallons, is situated at an elevation of 260 feet above the town, and is built with cement concrete coped with granite. A concrete cistern near the reservoir will receive the overflow water, and when full will automatically discharge it into the sewers for flushing purposes. The scheme, which has been carried out from the plans and under the superintendence of Mr. G. H. Harris, of Wadebridge, will, it is anticipated, be sufficient for all the wants of the town. The reservoir was formally opened yesterday week by Mrs. Ford, to whom the town is indebted for the gift of the water.

An explosion of acetylene gas at an hotel at Aix (Aube) recently killed two persons and injured 22 others.

The Skegness District Council propose to purchase the gas and water works from the Earl of Scarborough.

Messrs. Biggs, Wall, and Co. have received an order for four "Rapid" charging machines for a large gas-works in the north-west of England.

Carbide of calcium is now being retailed in India at the rate of 4 annas per pound, or about half the price at which it can be bought in this country.

The Shipley District Council last Wednesday approved of plans for filtration works at Baildon Bank reservoirs, the cost of carrying out which is estimated at £5500.

By an announcement which appears elsewhere, our readers will see that the Newport (Mon.) Gas Company are inviting tenders for £20,000 of consolidated 5 per cent. stock, applications for which are to be in before 10 a.m. on the morning of the 14th inst. It will be sold in £100 lots. The Company have paid full maximum dividends for upwards of forty years. The local quotations for similar stock range from £118 to £119 *ex div.* to £122½ to £123¼.

R. & A. MAIN, Ltd.

214, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

EDMONTON: GOTHIC WORKS. | BRISTOL: 28, BATH STREET. | MANCHESTER: 37, BLACKFRIARS STREET. | GLASGOW: ARGYLE WORKS, KINNING PARK. | FALKIRK: GOTHIC IRON-WORKS.

THE NEW "MAIN" PREPAYMENT METER COOKER & CENTURY GRILLER

Embody all the latest and most perfect developments in GAS COOKING-STOVES.

Cooker, Hot-Plate, and Oven, fitted with Burners, fixed or removable at will.

Full Particulars on Application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

ENRICH your Gas with cheap Benzol, Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE. Apply to SADLER AND CO., MIDDLESBROUGH.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.
MELROSE CYCLE COMPANY, COVENTRY.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see p. 1426.]

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Waggons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

YOUNG Man seeks Situation as Improver. Three-and-a-half Years' Experience on Gas-Works. Accustomed to all-round Trade, and knowledge of Smithing and Meter Taking. Age 19. Good Reference.
FRANCIS, 28, Frederick Road, Gorleston, GREAT YARMOUTH.

GAS-FITTER, &c.

APPLICANTS for the above Situation, advertised the beginning of last month, are THANKED and INFORMED that the SITUATION HAS BEEN FILLED UP.
H. TAPLAY,
Engineer and Manager.
Gas Offices, Wellington,
Dec. 1, 1900.

WANTED, a First-Class Draughtsman, accustomed to Designing Gas-Stoves.
State Age, Experience, and Salary required, to No. 3607, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PRACTICAL Working Gasman wanted for small Private Works in country. Must understand Gas and Water Fitting. Wages 20s. per week. Coal and House free.
AGENT, Haverland, NORWICH.

WANTED, a Man for Sulphate of Ammonia Plant. Wages 35s. per week. Coal will be allowed to a Married Man.
Apply, with References, to No. 3606, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, a first class FITTER. One accustomed to Internal Fitting, with both Iron and Compo., and to the fixing of Gas-Stoves.
Applications, with Testimonials and Wages required, to the MANAGER, Gas-Works, Ascot, BERKS.

AN opening occurs for a Gentleman, with some Chemical knowledge, either with or without Capital, to ASSIST the OWNER of a VALUABLE PATENT, whose time is taken up with other work.
P. 363, Deacon's, 154, LEADENHALL STREET, E.C.

A GAS Engineer in the Midlands has a vacancy for a PUPIL in his Office. The Pupil will have every opportunity of obtaining a thorough knowledge of Building and Machine Construction and other Branches of Engineering connected with the Gas Industry. References given and required.
Address No. 3597, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Provincial Gas Company, a FOREMAN GAS-FITTER, capable of Superintending Service Laying, the Fitting up of Houses under the Automatic Meter System, Fixing, &c., of Gas-Stoves; and any Outdoor Work in connection with the Company.
Write, stating Age, Wages required, and References, to No. 3609, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHESTER-LE-STREET GAS COMPANY.

THE Directors of the above Company invite APPLICATIONS for the post of GENERAL MANAGER at their Gas-Works. Annual make about 20 million cubic feet. Applicants must be thoroughly experienced in all Branches, including Main Laying, Retort Setting, Meter Taking, and Repairs. Free House, Coal, and Gas supplied.
Applications, with *copy* of Testimonials, to be sent to the undersigned on or before Monday, the 3rd of December, 1900, when applicants can attend personally if they wish at the Company's Offices between Three and Four p.m. Salary required to be stated in application. No expenses allowed applicants attending in person.
FREDERICK HARLE,
Secretary to the Company.
Chester-le-Street,
County of Durham, Nov. 22, 1900.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application.
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

CLERK of Works wanted to Superintend the erection of a large Three-Lift Steel Gasholder and Tank. None but thoroughly experienced Men need apply. Good Wages to competent Man.
Apply, stating Age, Experience, and Wages required, to No. 3610, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-RETORT CARBON.

WANTED, best Offers for about 4 Tons now ready for delivery on Rails here.
Dec. 1, 1900. BRIDLINGTON GAS COMPANY.

WANTED to purchase, Vols. XV. and XX. of the "JOURNAL."—Bound or unbound; but must be complete.
Address offers to No. 3600, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to purchase, One or Two TANK-TRUCKS for cartage from Works of Gas Liquor and Tar. Must be in good condition and cheap.
Send full Particulars, with Description as to Size and Price, to H. C. SHEPHERD, Manager and Secretary, Gas-Works, Swindon, WILTS.

WANTED, a small Sulphate of Ammonia PLANT (New or Second-hand), capable of Manufacturing the Liquor from 2000 Tons of Coal per annum.
State lowest Price on Rail, where to be seen, and Reference to where similar Plant is at work, to No. 3608, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FLUELESS GAS-STOVES.

APPLICATIONS are invited for right to MANUFACTURE and SELL a PATENT FLUELESS GAS-HEATING STOVE on Royalty Terms. Stove already on the Market, and ripe for development. Patent Rights could be Sold outright if desired. Patent also obtained for Flueless Gas Cooking Stove.
Apply to "X," care of Todd & Co., 43, Cannon Street, LONDON.

FOR SALE—5000 feet Gasholder, equal to new, with Four Columns complete, together with a quantity of Gas Plant. Any reasonable offer entertained.
H. GRAVES, Brandon, SUFFOLK.

LATEST AMERICAN INVENTION.

FOR SALE—The Receipt for Manufacturing
SELF-LIGHTING MANTLES, with GLOWING PILL.
A quicker Process than hitherto, and of almost Inexhaustible Duration.
Address J.B., care of Salomon's, 2, Jewin Street, Aldersgate Street, LONDON, E.C.

WALKER AND WALLSEND UNION GAS COMPANY, NEAR NEWCASTLE-UPON-TYNE.

FOR SALE—One Pair of Dempster's PATENT TOWER SCRUBBERS (fitted with Boards). The above are 36 feet high by 5 feet in diameter, with 12-inch Connections and Four-Way Valves.
For further Particulars and Drawings of same, apply to
A. B. WALKER,
Engineer and Manager.

J. FIRTH BLAKELEY & CO., Thornhill, Dewsbury, have FOR SALE:—
One Set of Three 6-ft. PURIFIERS.
One " Two 8-ft. "
One " Four 8-ft. "
One " Four 16-ft. by 12-ft. PURIFIERS.
Four 5-inch ANNULAR CONDENSERS.
Four 10-inch " "
Six 16-inch " "
"Cutler" ¾ million WATER CONDENSER.
Wrought-Iron TOWER SCRUBBERS, 3 ft. by 14 ft., 3 ft. 6 in. by 27 ft., and 7 ft. by 32 ft.
Cast-Iron TOWER SCRUBBERS, 3 ft. 6 in., 5 ft., and 6 ft. diameter.
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.
"Holmes" & "Clapham" WASHER-SCRUBBERS.
"Livesey" & "Cripps" WASHERS.
4-in., 6-in., 8-in., and 10-in. STATION METERS.
Splendid GASHOLDER, 50 ft. by 20 ft.
RETORT IRONWORK, MODERN HYDRAULICS.
Telegrams: "BLAKELEY, THORNHILL LEES."

FOULGER-GLOVER TORCH.

SHUT
As used for Flat-Flames.

MAKERS AND AGENTS.

W. SUGG & CO., Ltd., Vincent Works, Regency Street, Westminster, S.W.

THOMAS GLOVER & CO., Ltd., 214, St. John Street, Clerkenwell.

WILLEY & CO., St. Thomas, Exeter.

W. EDGAR, 23 & 24, Lower Mall, Hammersmith.

PHŒNIX SUPPLY CO., 15, Hosier Lane, E.C.

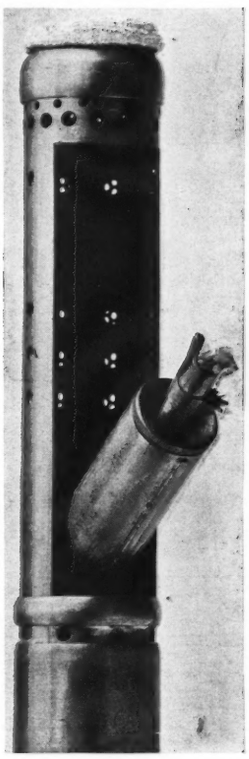
S. BEAL, 676A, Old Kent Road, S.E.

W. H. TILLEY, 53, Kingsland Road, N.E.

S. PONTIFEX & CO., 22, Coleman Street, E.C.

R. & A. MAIN, Ltd., Argyle Works, Kinning Park, Glasgow.

F. COLSELL, 2, New London Street, E.C.



OPEN
As used for Incandescent Lights.

This Torch will light Incandescent Burners as easily as the Ordinary Torch will light flat-flame Burners. Consequently, there is no need for any complicated mechanism being inserted into the Lanterns of the Incandescent Burners.

Lamplighters who have used these Torches extensively for the past three months for lighting both Incandescent and flat-flame Burners speak most highly of their efficiency.

Price 40s., less 2½ per cent. for cash.

London: Printed by Walter King (at the Office of King, Sell, & Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London—Tuesday, Dec. 4, 1900.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

HIGH-PRICED COAL.

SMALL Gas-Works Authorities should immediately adopt an EXHAUSTER, and thus make probably at least 750 cubic feet of gas more from each ton of Coal carbonized. Several small sets *in stock*, both New and Second-hand.
Address J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

TO BE LET on Hire—
FACING MACHINE, for facing *in situ* Self-Sealing Retort Mouthpieces any shape or size, D, Oval, or Circular.
PULSOMETER, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe ¾ in. diameter. Discharge 10,000 Gallons per hour.

TO BE SOLD—
GASHOLDER, 30 ft. diameter by 10 ft. deep, with Five Columns, equal to new, only having worked Four or Five Years.
Write J. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C.

TOWN AND COUNTY OF POOLE GAS AND COKE COMPANY, LIMITED,

HEREBY invite Tenders for the pur- chase of 201 ORDINARY "C" SHARES of £10 each, bearing a Statutory Dividend of 7 per cent. per annum.
The said Shares will be issued at the Minimum Price of £15 per Share, and in Lots to suit Purchasers.
For further Particulars and Form of Tenders, apply to

WILLIAM DAVIS,
Secretary.

Gas Office: Poole, Dorset,
Nov. 27, 1900.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

TAR CONTRACT.

THE Directors of this Company invite TENDERS for the whole of the TAR produced at their Works for the Year, 1901.
Quantity about 70,000 gallons.
The Contractor will be expected to find his own Casks for the removal of the Tar, and to accept delivery of the same at Blackhill Station.
Tenders to be sent to the undersigned not later than Dec. 12, 1900.

M. RICHLEY,
Secretary.

Nov. 28, 1900.

BOROUGH OF LEIGH.
(GAS DEPARTMENT.)

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the carrying out of various WORKS in connection with the Erection of a Set of Six 30 feet square PURIFIERS, including VALVES and CONNECTIONS, &c.
Plans and Copies of Specification, with Terms and Conditions of Tender, may be obtained at the Office of the Engineer, Mr. John Foster, Gas-Works, Leigh, Lancashire, on and after Friday, the 30th day of November, 1900, on the payment of Three Guineas, which sum will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Tender for Purifying Plant," must be addressed to me at the Town Hall, Leigh, Lancs., and delivered on or before Twelve o'clock noon, on Monday, the 17th day of December, 1900.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
PEREGRINE THOMAS,
Town Clerk.

Town Hall, Leigh, Lancs.,
Nov. 26, 1900.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCK AND BONDS, WILL BE CLOSED at Four o'clock p.m., on Monday, the 10th prox., for the Half Year ending on the 31st prox., and will be RE-OPENED on the morning of Tuesday, the 11th prox.
The Interest for the Half Year will be payable on the 1st of January next, to the Proprietors registered on the closing of the Books.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Nov. 29, 1900.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that an EXTRAORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office, on Monday, the 17th of December, 1900, at Twelve o'clock (noon) precisely, when the Directors will apply to the Proprietors for authority, in pursuance of the Powers of the Gaslight and Coke Company's (Capital Consolidation) Act, 1898, to raise Additional Capital by the creation and issue of a further Sum of £125,000 of new ORDINARY STOCK, and to raise Additional Money by the creation and issue of a further Sum of £100,000 of 3 per Cent. CONSOLIDATED DEBENTURE STOCK.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Nov. 30, 1900.

NOTICE.

COIN-FREED GAS-METERS.

IN the Month of September last Year, an Advertisement appeared in these Columns warning Makers and Users of COIN-FREED GAS METERS fitted with "ANY DETACHABLE PREPAYMENT ATTACHMENT" against Infringing the Patent Rights of Messrs. Meters Limited, of Manchester.
Following upon this Advertisement, an Action was instituted by that Firm against us, in the High Court of Justice, concluding for an Injunction restraining us from Infringing their alleged Patent Rights, and for Damages.
After entailing considerable expense upon themselves and upon us, Messrs. Meters Limited had to ABANDON THE ACTION, leaving us in possession of the field, and they have now ended the matter by PAYING OUR JUDICIAL EXPENSES.

ALDER & MACKAY.

New Grange Works,
Edinburgh, Nov. 24, 1900.

WEST MIDDLESEX WATER-WORKS COMPANY.

ISSUE OF £100,000 THREE POUNDS PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUE, being a further portion of the £690,000 DEBENTURE STOCK created under the West Middlesex Water-Works Acts, 1894 and 1899, bearing Interest at 3 per cent. per annum, and redeemable after the expiration of 25 years from the date of issue, subject to Six Months' Notice being given by the Company.
Tenders must be delivered at the Company's Office, No. 19, Marylebone Road, N.W., not later than Eleven a.m. on Tuesday, the 18th of December next.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Office, or will be forwarded on application.

By order of the Board of Directors,
F. H. WYBROO,
Chief Clerk and Secretary.

No. 19, Marylebone Road, N.W.,
Nov. 20, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.
He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.
Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
MAIDSTONE GAS COMPANY.

NEW ISSUE OF £4000 NEW ORDINARY STOCK, AND £2300 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 10, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

£7500 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 10, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF 226 "D" WATER SHARES OF £10 EACH.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 10, at Two o'clock.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 10, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WATFORD GAS AND COKE COMPANY.

£150 "C" STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION at the Mart, E.C., on Monday, Dec. 10, at Two o'clock.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CHELSEA WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL MEETING of the Governor and Company of Chelsea Water-Works will be held at their Office, Commercial Road, Pimlico, in the County of London, on Thursday, the 20th day of December prox., at One o'clock in the Afternoon precisely, for the General Business of the Company.
The REGISTER of TRANSFERS WILL BE CLOSED between the 8th day of December prox., and the 20th day of December prox., both days inclusive.

By order,
G. H. GILL, Secretary.

London, Nov. 24, 1900.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS in respect both to the FOUR-AND-A-HALF PER CENT. and THREE PER CENT. DEBENTURE STOCKS WILL BE CLOSED from the 13th of December to the 31st of December inst., both days inclusive, and REOPENED on the 1st of January, 1901, on which date the Interest Warrants on these Stocks will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, Bishopsgate, E.C.,
Dec. 3, 1900.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED at Ten o'clock forenoon on Friday, Dec. 7, 1900, for the Half Year ending the 31st of December, 1900, and will be RE-OPENED on Saturday, the 15th inst.
The Interest for the Half Year will be payable on the 1st of January next, to the Proprietors registered on the closing of the Books.

By order of the Board,
JAMES RANDALL,
Secretary.

Gas Offices: Willoughby Lane,
Tottenham, Nov. 30, 1900.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO BE SOLD by Auction, in the Board- Room of the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 11th of December, 1900, at Half-past Twelve o'clock precisely, by Mr. CHARLES A. JOEL, in such Lots as are provided for in the Company's Act of 1894—
FIFTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894).
Printed Particulars and Conditions of Sale may be had at the Company's Offices, and Messrs. George Armstrong & Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 66, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH, Secretary.

Newcastle-on-Tyne,
Nov. 14, 1900.

NEWPORT (MON.) GAS COMPANY.

SALE BY TENDER OF
£20,000 CONSOLIDATED STOCK.

IN PURSUANCE OF THE NEWPORT (MONMOUTHSHIRE) GAS ACT, 1900.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £20,000 of CONSOLIDATED STOCK of the Company, in Lots of £100 each, such Stock to bear a Maximum Dividend of 5 per cent. per annum, and to be paid up in full on or before the 31st day of December, 1900; being part of the New Capital created under the Newport (Monmouthshire) Gas Act, 1900, and authorized to be raised by a Resolution passed at a Meeting of the Proprietors of the Company specially convened for the purpose, and held on the 13th day of August, 1900.
Particulars and Conditions, with Form of Tender, may be obtained on application to this Office; and Sealed Tenders must be sent in not later than Ten o'clock a.m., on Friday, the 14th day of December, 1900.

By order,
T. H. HAZELL,
Secretary.

Gas Offices: Newport, Mon.,
Nov. 23, 1900.

HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, LIMITED.

SALE OF SHARES BY TENDER.

(IN PURSUANCE OF THE HOYLAKE AND WEST KIRBY GAS AND WATER ORDER, 1899.)

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER so many ORDINARY NEW £5 SHARES as shall, with Premiums, realize the sum of £5000 applicable to the Gas Undertaking, and so many ORDINARY NEW £5 SHARES as shall, with Premiums, realize the sum of £7000 applicable to the Water Undertaking. The Shares in the Gas Capital under this Order are subject to the Sliding-Scale, with a Standard Dividend of 7 per cent., while the Shares in the Water Capital may rank for Dividend up to a maximum of 7 per cent.
The Directors also invite OFFERS to ADVANCE the SUM OF £1250 for a term of Seven Years upon the security of the Gas Undertaking, and the SUM OF £1750 for a term of Seven Years upon the security of the Water Undertaking.
Forms and Conditions of Tender may be obtained from the undersigned, to whom Sealed Tenders must be delivered not later than Ten a.m. on Wednesday, the 12th day of December, 1900.

By order of the Board,
A. G. READDY,
Secretary.

Registered Offices: 5, The Quadrant,
Market Street, Hoylake, Nov. 14, 1900.

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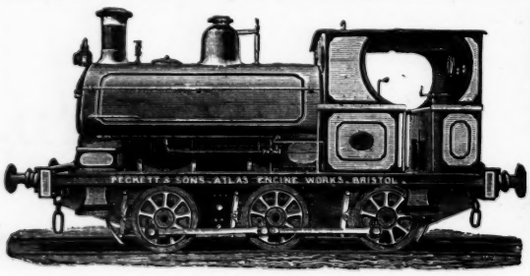

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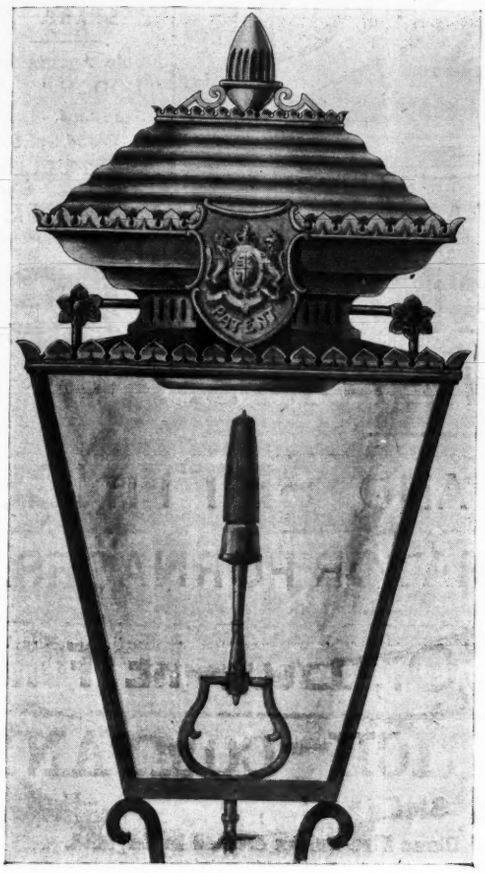

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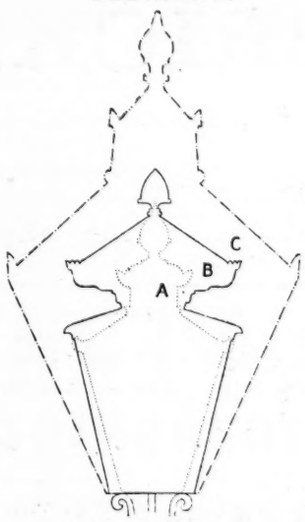

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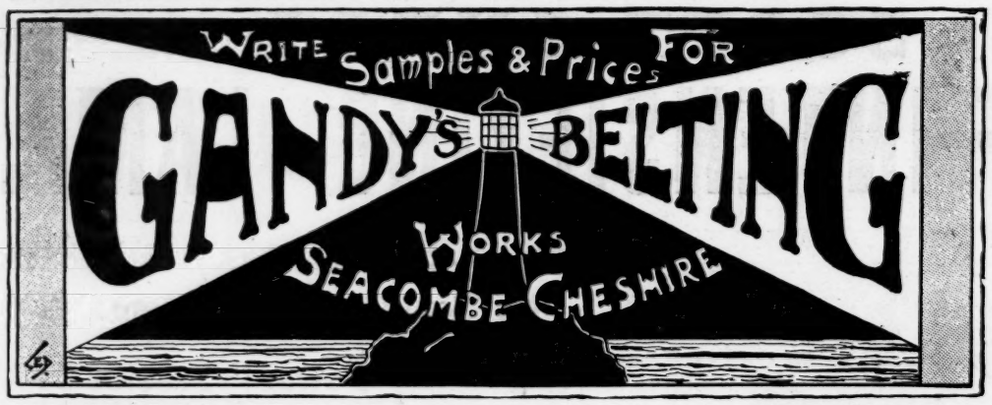

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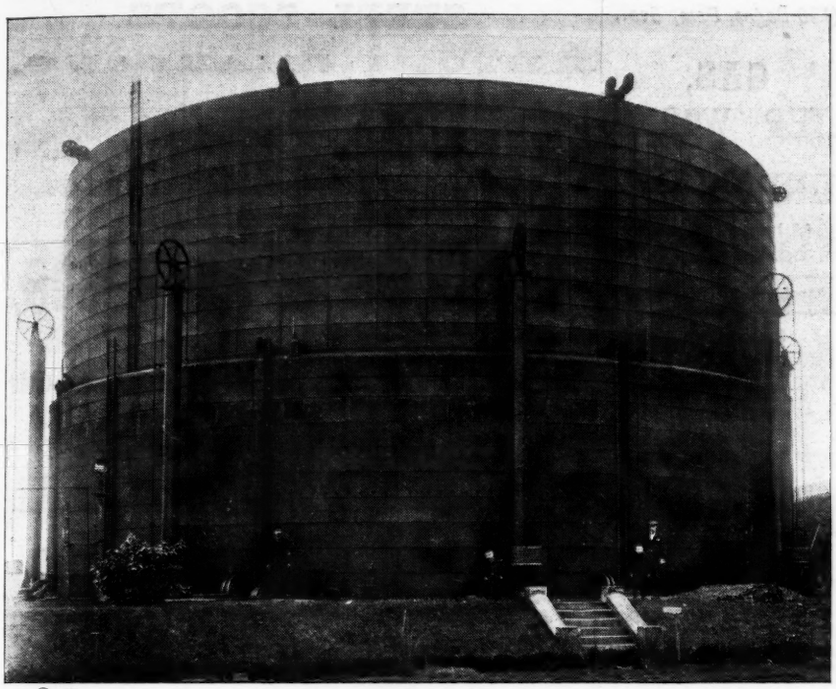

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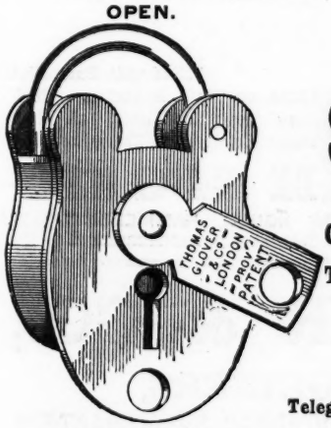

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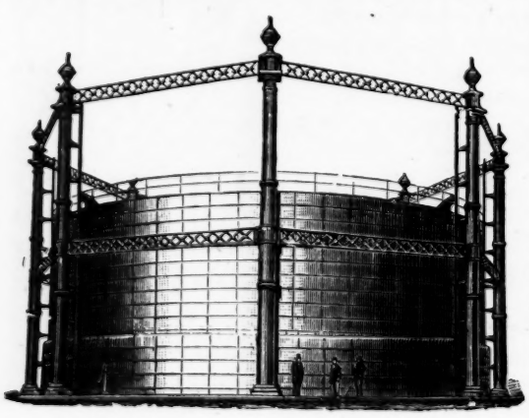

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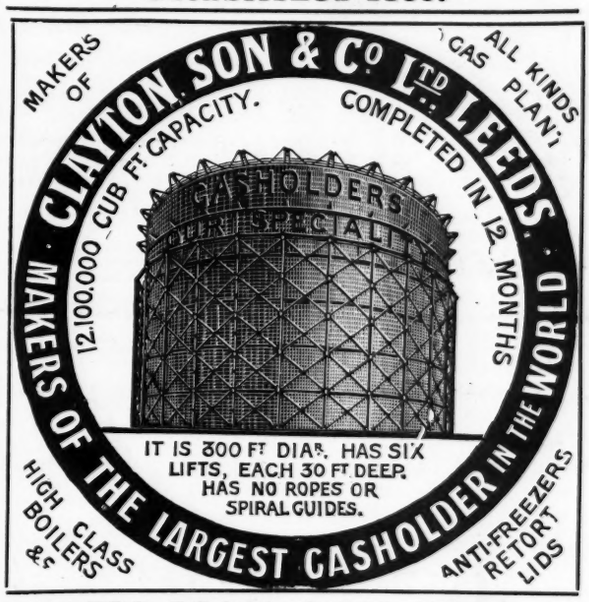
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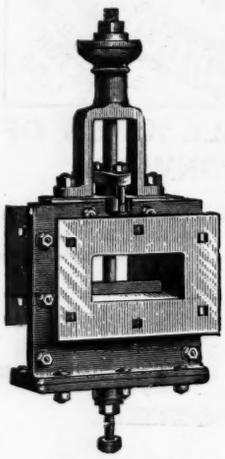

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